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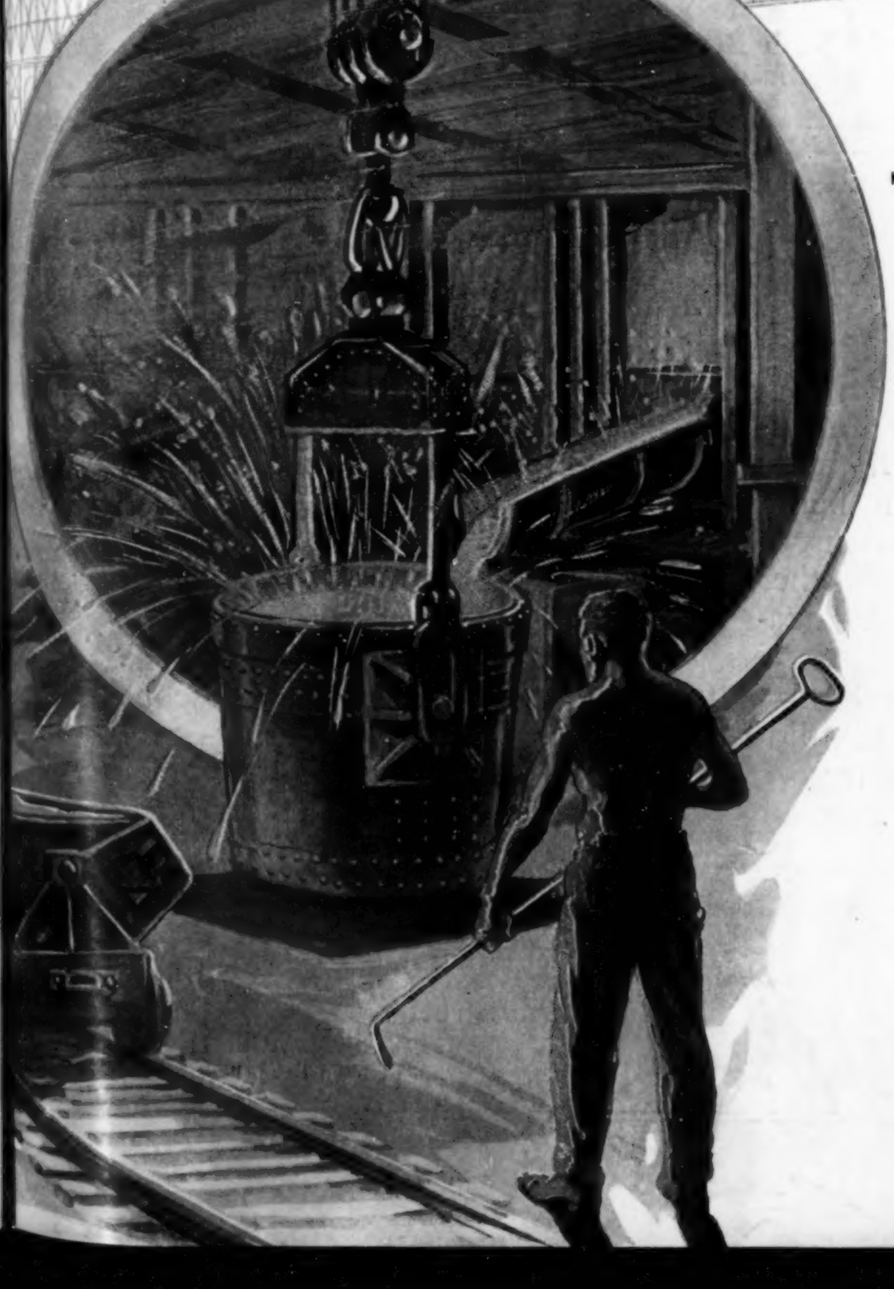

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CHEMICAL & METALLURGICAL ENGINEERING

H. C. Parmelee
Editor

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Isolation or Co-operation as a Factor in Industrial Advance

AN INDIVIDUAL may claim the sole credit for an invention and thereby attempt to justify secrecy and isolation, but he overlooks the fact that almost from the time of his birth he has been steadily absorbing the best that other inventors have given to the world. That a fundamental principle is unpatentable is no proof that at some time or other inventive initiative has not been used to test and develop it. Because print is so common and the accumulated wisdom of the ages is so easily available is no reason for selfishness, or unforgetfulness of our obligations to add something to the sum total of human knowledge and to the progress of civilization. At times secrecy is justified and advisable, but we make a plea for publicity in those instances where the good of the majority would result and where nothing but credit and profit would accrue to the inventor. Many a good idea has brought neither credit nor reward to its sponsor, because of a decision to prevent others from enjoying the benefits that would result from its adoption. It was the secrecy of medieval "science" that caused it to be discredited.

Another aspect of the question deserves attention: An industry will stand or fall according to the degree of co-operation in evidence among its members. Technical publicity on the part of one operator helps to insure the prosperity and the solidarity of the industry as a whole; and a good example is infectious. Secrecy and mystery act as spurs to initiative in other directions, and the adoption of an attitude of frankness by a competitor may lead to the acceptance of a substitute product before the public is aware of the technical advantages of the one that is displaced. It is impossible to strike a balance as to how much information an individual or a company should divulge and how much should be kept secret. We were recently approached by a chemist who had devised and applied for a patent on a special process, now in successful operation. Pending the granting of the patent he had decided on a policy of secrecy. The success of the process became known, however, because of the high quality of the product, and spies were sent to the plant to bribe subordinates into a disclosure of the details. The inventor became perturbed to an extent that led to the harboring of suspicions as to the loyalty of his staff. We suggested that the details of the process would eventually leak out; and that, in all probability, action would then be taken by unscrupulous competitors which would deflect attention from him as the pioneer inventor. A technicality might prevent the granting of the patent, in which event he would find it difficult to reap any benefit from his initiative. He accepted the logic of our arguments and decided on a policy involving the full and frank publication of details.

Publicity, wherever practicable, will help the chemical industry primarily; and a uniform policy of contributing something to the advance of technology will help to place each of the various branches on a firm basis, to the encouragement of capital and the support of public opinion.

Maintaining Standards In Naval Stores

AS REPORTED last week in *Chem. & Met.*, the Bureau of Chemistry has actively undertaken the enforcement of the naval stores act with funds that became available on July 1 of this year. In this work the bureau will provide for the grading of rosin and the testing of turpentine, both on its own initiative and in response to request by either producer or purchaser. A carefully prepared scheme of inspection and service has been developed by the bureau, but in this work there is still bound to be some undesirable delay and perhaps criticism. These unfortunate results are forecast, despite every evidence of the bureau's desire and effort to do work promptly and satisfactorily, because of the limited funds and facilities available.

It will be necessary for both producers and users of naval stores to co-operate with the government agencies if anything like satisfactory service is rendered. Obviously the bureau cannot hope with $10,000 per year to put more than three well-qualified inspectors into the field. In fact, to provide this number the bureau has been compelled to curtail somewhat its investigations of naval stores, a result highly unfortunate, especially at this time.

But the lack of sufficient personnel is not the only difficulty to be expected. Our knowledge of the exact chemical composition and the physical characteristics of rosin and turpentine is still too limited to be satisfactory. As a consequence there remains ground for uncertainty in tests for the presence of small quantities of adulterants, to cite only one example of the difficulties that may arise. The particular trouble that can be expected is the determination of whether so-called "pure gum spirits" contain some steam-distilled turpentine. Large quantities could, of course, be readily detected, but it is quite a problem to know just how small an amount can be recognized with sufficient certainty to permit grading of a material as "adulterated" without fear of injustice to the owner.

There is only one way in which to solve this shortage of technical knowledge promptly. It is by closer co-operation of the producing and consuming industries with the bureau. A very simple plan could be adopted for this purpose. It would only be necessary for producing and using companies to join in placing research associates in the laboratories of the Bureau of Chemistry. There they would be under skilled direction and

could work with highest efficiency on designated problems that promise better guidance for naval stores inspectors and increased information of industrial value. Two or three men working on this basis would undoubtedly advance by many months, if not by years, the time when better standards could be established and better methods of utilization made commercially possible. It will be very profitable for some of the leaders of the industries to look into the matter and see if a mutually agreeable plan can be evolved.

Yesterday, Today And Tomorrow

IT IS not easy to portray, briefly and accurately, the social and industrial status of present-day America in the light of conditions that existed 50 years ago or that may well prevail 50 years hence. But in a recent contribution to the *Atlantic Monthly* entitled "Physics and Civilization," Dr. Arthur D. Little has succeeded admirably in giving the outlines of the picture. It is especially gratifying that he shows what a large part of our progress has been made possible by the chemical engineer, and only regrettable that he does this so subtly that the average layman may not realize that applied industrial physics and chemical engineering are often very closely allied.

Broad as the considerations involved in such a discussion must inevitably be, Dr. Little develops in small compass a comprehensive picture of our scientific and humanitarian advances. For instance, he says in part:

> During the last 50 years science and invention have led us farther and farther from the world that was; deeper and deeper into a new environment. The process of change has been so rapid that readjustment has been difficult. Yet readjust ourselves we must, and prepare for new adjustments. Our dealings with Nature in the past have been by crude and clumsy methods. The chemistry of the laboratory is put to blush by that of the plant cell. We face the problems of the future with a new knowledge of the ultimate structure of matter, derived from radium, atomic spectra and the X-rays. What has gone before is mere earnest of the future. We may confidently depend on science to provide the foundation for a better social structure, if we can prevail upon ourselves to build thereon in a different frame of mind.

The perspective necessary for the appreciation of the essential facts relevant to the discussion of such a topic seldom is found in the scientific worker. For this reason the essay is well worth the time required for its perusal. Every reader must lay it aside with a new consciousness of the factors governing previous growth and the future tendencies of our industrialism and modes of living.

Why have the one-time domestic industries all but disappeared? What of the methods of baking and preserving and marketing of food that were but a short time ago in vogue? Where is our developing city civilization leading us?

The answer to all these questions is that local centralized industry has done much to abolish the older modes of existence. Nationally speaking, however, Dr. Little points out that progress is going to demand to an increasing extent decentralization of industry. The time must come when no longer one-half of our entire industrial activity takes place in a narrow strip along the Atlantic seaboard from Boston to Washington. The economic waste of long haulage of raw materials must cease. Possibly Louisiana may one day become a great chemical center because of its oil, gas, sulphur and salt resources. In the South the textile industry is certain to become great, likewise the production of kraft paper may be expected to grow there. Superpower will aid in decentralization, as will also a high-pressure gas-distributing system with producers at the mines. Gas companies generally, it is estimated, will do five times their present business and instead of selling 25 per cent of their product for industrial purposes they will sell 75 per cent. The smoke nuisance must go; the full value of coal must be retained. To this end low-temperature carbonization on an extensive scale is prophesied. Simultaneously with the new order we shall be forced to discontinue our now growing use of petroleum. From our mineral oils we shall synthesize organic products, for motor fuel we shall turn to oil shale. Inasmuch as the rate of our economic progress is a function of the abundance and cost of energy, much attention will continue to be given its production and increasingly efficient use.

It is impossible to repaint the picture and do it justice. Dr. Little expects that our industries are now entering upon a period of super-competition, caused largely by a restriction of our foreign markets. We shall learn to utilize the abundant metals beryllium, hafnium, calcium and magnesium; we shall make use of straw, weed wood and lumber waste; we shall have pure iron bright as silver.

Such conceptions as these are not too daring to be considered founded on fact and not fancy. They give us a refreshing glimpse from the today that we know to the tomorrow that we anticipate. It is more than evident that just as the chemical engineer has taken a most important part in creating our present-day civilization, he is to be called on to accept even greater responsibilities in the future.

The Weakness of Economic Forecasting

ECONOMIC forecasting achieved a legitimate prestige a few years ago. Those who were studying economic conditions seemed to be able to make shrewd guesses about future business prosperity or the lack of it. Particularly spectacular was their success in 1921, when they were able to predict the terrific deflation some months ahead of its occurrence.

This prestige has waned somewhat for two reasons.

In the first place, there have been no spectacular changes like those of 1921, and no such changes are probable within the next decade. This inevitably tends to make a dead level of economic balance. Seasonal or periodic depressions in a single industry are lost in the general average. In fact, a great industry might pass through a terrific depression and finally die without having a noticeable effect on the country's prosperity or upon the state of depression or health of industry in general. Here, then, is one great obstacle that will always stand in the way of making economic forecasting of value to the individual business man—unless a change is national, disastrous or cataclysmic it may not be discernible in the vastness of business transactions as studied by economists.

There is another reason why economic forecasting has lost prestige. It reminds one of the astrology of early days. By shrewd guessing the white-bearded gentlemen in flowing robes had established for them-

selves an enviable reputation. But they seemed not content. They began to assume infallibility. Astrology became a "science" instead of an art; and instead of being interesting it became merely tiresome. Attention was then focused not on its successes but on its failures and applause turned gradually to mockery.

The analogy between astrology and economic forecasting is suprisingly valid. The latter also developed as an art in which the shrewd guesser established a wide reputation under somewhat favorable conditions. Then either by natural evolution or because of a premonition of failure by the guesswork route a prolonged effort was made to place the art of forecasting on a scientific basis. This, it seems to us, was doomed to failure. There is no long experience with economic changes and cycles on which to draw, and even if there were, the vast number of contributing variables are unknown and impossible to determine by analysis. Therefore at best predictions would still remain shrewd guesses.

There is one more point that must not be forgotten in connection with economic forecasting, especially when it covers long periods of time. It cannot take account of the advances that science and engineering are to make. The economic forecasters of the Civil War period predicted an increasing price for steel, but reference to price records shows an unbelievable drop due to scientific and engineering advance.

Economic forecasting has great value in calling the attention of the business man to the general trends of business and in warning him of changes that would affect the whole country. But it is not and never can be a safe and complete guide to the conduct of an individual business any more than one can say that a given drop of water in the ocean will come in with the tide.

Fertilizer Industry Loses a Great Leader

IN THE death of W. D. Hurd, who for 5 years had been directing the important work of the soil improvement committee of the National Fertilizer Association, the industry loses a great leader at a time when leadership can ill be spared. Never before has there been so much need of constructive scientific thinking and guidance in the manufacture and use of fertilizers; and it will be with a keen sense of loss that the association will approach the problem of naming a successor in this important work.

A part of the solution of the fertilizer industry's ills will be found in the more extensive use of fertilizer by the farmer. But this will come only from a better knowledge of fertilizer value and a conviction on the part of the farmer that the claimed value will actually be realized. Very few have ever labored in this field who have commanded confidence so widely or who have been accorded such consistent support in his judgment and recommendations as has Mr. Hurd. His relations with state and college experiment stations were of the highest value, both to the investigators and to the fertilizer industry that must make practical use of experimenal results. Within the fertilizer industry itself he was found a wise leader and counsellor as well as a warm and congenial friend. As liaison officer between producer and consumer he made notable progress in interpreting the one to the other.

It is most important that the industry arrange immediately for the continuance of the work that has been done by the soil improvement committee under the direction of Mr. Hurd. It cannot afford to lose the advantage of this service even for a single season. In fact, the work should be doubled or multiplied many fold rather than curtailed. But in planning for its continuance leaders of the industry must bear in mind that it was the high scientific standard and the unquestioned sincerity in his work that gave the greatest value to Mr. Hurd's service. Mere enthusiasm will not do. Real scientific knowledge and a willingness to limit enthusiasm to the point of demonstrable success on the farm are first essentials.

Chemical Engineering and The Foodstuffs Industry

AN EXCELLENT example of the important bearing that chemical engineering may have on the disposition of foodstuffs and the prosperity of an undertaking is shown by the jubilation in the American raisin industry at the present time in consequence of the payment of unexpected dividends, an advance on the 1924 crop of at least 2c. per pound in September and an ability to handle with ease an increase in production amounting to more than 60,000 tons per annum. The surplus, amounting to about 100,000 tons per annum, is to be used for the manufacture of what are known as "converted products," details of which will be available later. Suffice to say that the change in fortune in the industry is due almost entirely to the outcome of chemical engineering research in the development of such byproducts and to the perfection of methods of manufacture. These byproducts are of a standard reached only by chemical processing and chemical control, a standard that is almost entirely independent of the grade of the raw material used. The significance of the progress made is therefore difficult to overestimate. A market for the new products is assured.

The general public has been well aware of the vicissitudes that have marked the recent history of the American raisin industry. The marketing of a crop of which a large proportion of the fruit is of small size presents unusual difficulties, especially if the high cost of processing the fruit for sale as such is taken into account. At one period it was thought that the situation could be saved by intensive advertising and by an appeal to the ignorant. Many will recall the "Have You Had Your Iron Today?" advertisements that shouted an absurd inference from square miles of space. The lesson was learned, however. The percentage of iron in raisins is easily ascertainable, and the public refused to be gulled by claptrap of this character. One hundred thousand tons of excess raisins cannot be shoved down the throats of an unwilling public, even with the aid of an army of the most highly paid advertising experts, rapid-fire solicitors and experienced slogan makers in the country. Real progress and continued prosperity can be reached only by employing the scientist and the technologist. Languishing industries, in which bull-headed business methods have predominated to an extent that has meant the discouragement of research on the manufacture of byproducts and the utilization of waste material, would do well to study the effects of the broad-minded policy adopted recently in the raisin industry. The chemical engineer is rapidly coming into his own.

Modern Practice in Electrolytic Chlorine-Caustic Production

Chemical Engineering Plays an Important Role in Applying Theory to Efficient Practice at the Plant of the Eastern Electro-Chemical Co., Bangor, Me.

By Harold J. Payne
Of the Editorial Staff of *Chem. & Met.*

The chlorine-producing capacity of the United States has been shown to be nearly twice that required to meet demand. Such a condition naturally has a stimulating effect upon operating methods—methods that in the past have been carefully investigated and highly developed by master engineers.

Price wars among large chlorine and bleach producers have placed concerns maintaining independent electrolytic plants in a quandary. Here is the story of a plant that has operated steadily in the face of adverse conditions; that is establishing precedents in its application of scientific principles to practical technology.

CHEMICAL ENGINEERING IN INDUSTRY

ELECTROCHEMISTRY and chemical engineering travel hand in hand in the production of chlorine and caustic soda electrolytically. The operation of the cells in which the major reaction of the process is conducted is obviously a problem of electrochemistry, but the preparation of the brine, evaporation and fusion of the caustic, recovery of the undecomposed salt and absorption of the chlorine are problems of chemical engineering. This becomes clear when consideration is given to the practical operation of such a small-scale plant as that of the Eastern Electro-Chemical Co., working in conjunction with the pulp and paper mills of the Eastern Manufacturing Co. at Bangor, Me. Here we find that great pains have been taken to provide straight line flow of materials in the plant. Beyond making this provision in the beginning every means is taken to insure most economical production in the light of modern practice.

In order to be practicable on a small scale, cheap power is a factor of primary importance in determining the feasibility of chlorine-caustic production. Fortunately, that is frequently available at paper and pulp mills, to which such a plant is most often an adjunct. Consideration of overhead indicates that rather heavy cell depreciation must be planned for as well as the payment of royalties on most types of apparatus commercially available. The items of fuel, labor and material naturally play a rather important part as to whether or not independent bleach production will be profitable. Disposition of the caustic soda made is automatically provided for in those mills using the soda process, but at sulphite mills provision for the disposal of this material must be planned for otherwise. In this plant the caustic is evaporated, fused and sold in drums to the trade, including soda mills in the near vicinity.

In a plant costing \$200,000, with a production of about 6,100 lb. of chlorine per 24 hours, the overhead and fixed charges (including royalties) exceed \$200 per day. This includes the labor of twelve men and supervision, but does not provide for materials used. These latter consist of salt, lime, a small amount of hydrochloric acid and fuel. These materials vary in price with the market, but usually less widely than the finished product. The operation of the plant depends upon the type of cells used, the degree of control exercised and to a lesser extent upon the layout of the plant. In this plant the brine is formed at one end, flows through the cell room and continues as caustic liquor to the evaporator room, to the pots and then still in the same direction to storage. The chlorine makes one turn, then runs through the absorption towers, storage and filter, out of the plant near where the salt entered.

Storage of salt above a saturator tank 4 ft. in diameter by 18 ft. high is shown in Fig. 2. Experiments have proved that practically complete saturation (98 per cent) is obtained with one passage of hot water up through salt-filled tanks when the rate of flow does not exceed 6 cu.ft. per minute. Two hours operation of the saturation plant makes sufficient brine for a day's run. The crude salt is obtained from mines near Syracuse, N. Y.

It is essential that sulphate and alkaline earth contamination, as well as the solid suspension existing after saturation, be removed. Sulphate is especially troublesome, since it has the indirect effect of eating away the graphite anodes. The purification is carried out in a series of three tanks. After settling in the recirculation tank, the brine is treated with carbonate of soda and barium chloride—if necessary—in the second, and pumped through a small Kelly filter to remove the sludge. It has been found that the use of a small amount of sulphite pulp or kieselguhr acts as an ideal filtering aid for producing a clear brine. From the filter the liquor runs into an acidification tank, where hydrochloric acid is added to give a free acid concentration of about 0.06 lb. per cu.ft.

Appreciable increase in the free acid concentration was found by Hanson and Wylde, experimenting on the plant, to increase the percentage of byproduct formation. As operated at this plant, the cells produce chlorate (2.8 per cent), hypochlorite (0.7 per cent) and oxygen (3.5 per cent), all of these figures being based on the total chlorine, supplied as NaCl. Decrease in acidification was found to have the same effect, and the

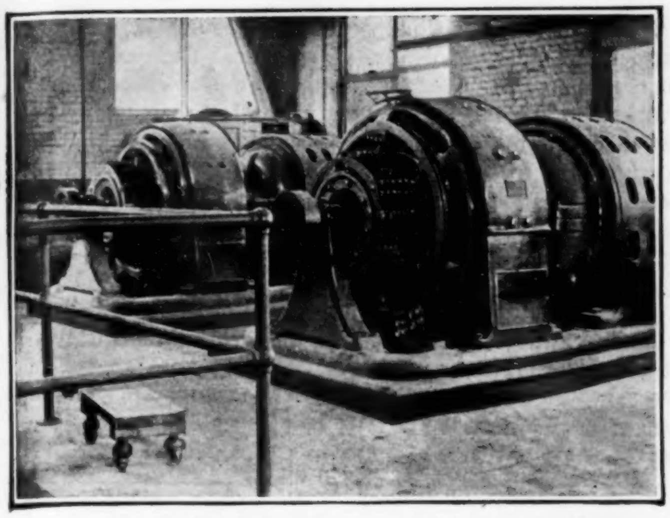


Fig. 1—Motor Generator Sets Supplying Power to Cells
Alternating current is here converted to direct current at an amperage of 1,750. The railing at the left indicates position of switchboard where complete control of input to the cells is maintained.

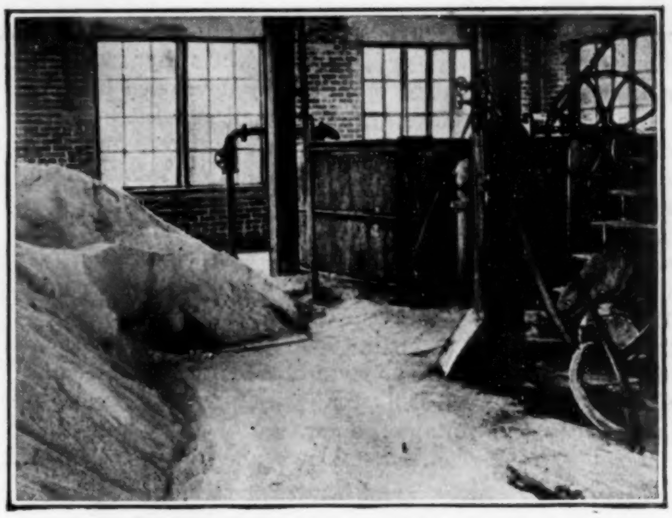


Fig. 2—Brine Preparation and Treating Room
Salt is elevated to top of saturator, shown above at base of pile. One batch is prepared for each day's run. The wooden tank in background is used for precipitating impurities, including carbonates and sulphates.

use of an alkaline brine was found to be undesirable. The byproducts formed are all a nuisance; oxygen attacks the graphite anodes, hypochlorite tends to corrode the tubes of the evaporators, while chlorate in the caustic as it goes to the pots means a chloride contamination in the finished product that cannot be removed.

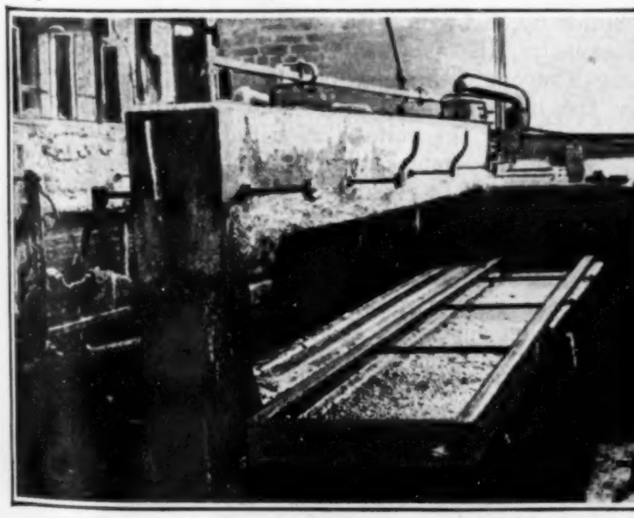
Operation of the Cells

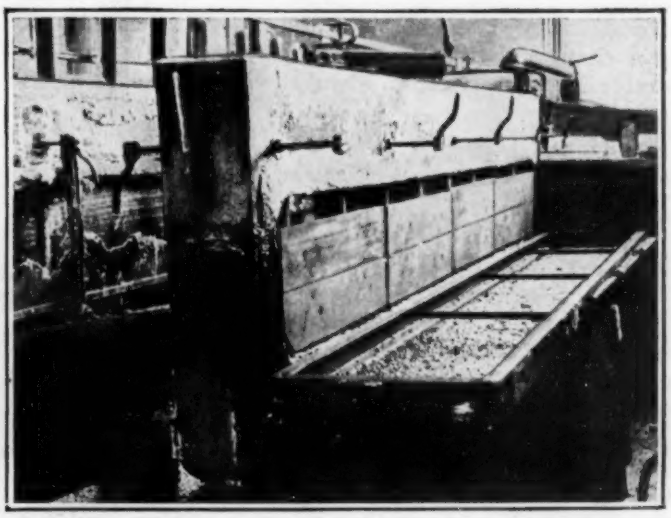
For conducting the electrolysis sixty-four Allen-Moore cells are used, arranged in banks of thirty-two and operated in series. Power is supplied by two motor generator sets at an amperage of 1,750. This current gives a density over the anode of 87.5 amp. per sq.ft., higher than that recommended by the makers, the Electron Chemical Company, but found to give excellent results in daily operation.

The production of the cell is high for its size and for the amount of power consumed. Normally its conversion of salt to caustic or "decomposition efficiency" averages about 50 per cent—a figure making the evaporator problem reasonably simple.

The construction of the Allen-Moore cell is simple—thoroughly familiar to all those in the industry. A unit consists of a rectangular cement frame—base, ends and top—inclosed on the sides by asbestos diaphragms held in place by perforated cathode plates and channel iron frames. In the chamber thus formed the anodes are placed with a clearance of ½ in. between their faces and the diaphragm. When electrolysis takes place chlorine ions migrate to the graphite anodes, are released there as gas, and travel up along these anode surfaces into the chamber above; sodium ions move through the asbestos diaphragm to the cathode, react there with hydroxyl ions of water and flow off as caustic soda solution along the bottom of the cathode frame together with the undecomposed brine and down into the drain; hydrogen rises from the cathode and is released to the atmosphere.

In some plants, having large installations of such cells as these, the hydrogen is collected and purified to be used for hardening peanut or other oils. Unfortunately the market for hydrogenated oil and for the ordinary hard fats of commerce is such that a slight decrease in the price of the latter makes the margin of profit in operation slight if appreciable. In at least





Figs. 3 and 4—Cell Open for Anode Replacement
Construction of the Allen-Moore cell is clearly shown in these cuts. On left the cement body is shown practically dismantled, while the picture on the right shows how the anode blocks are placed. In both pictures the iron cathode frame is shown lying flat. The gage at end of cell indicates brine level. On the extreme left the manner of holding the cathode in place is shown.

one plant the hydrogen is burned directly with chlorine, thus forming a high-grade water-white hydrochloric acid. This use might be more widely developed but for the fact that the marketing of a small amount of pure acid is a difficult proposition. Unfortunately there is no outlet for any considerable amount of this acid in paper or pulp production.

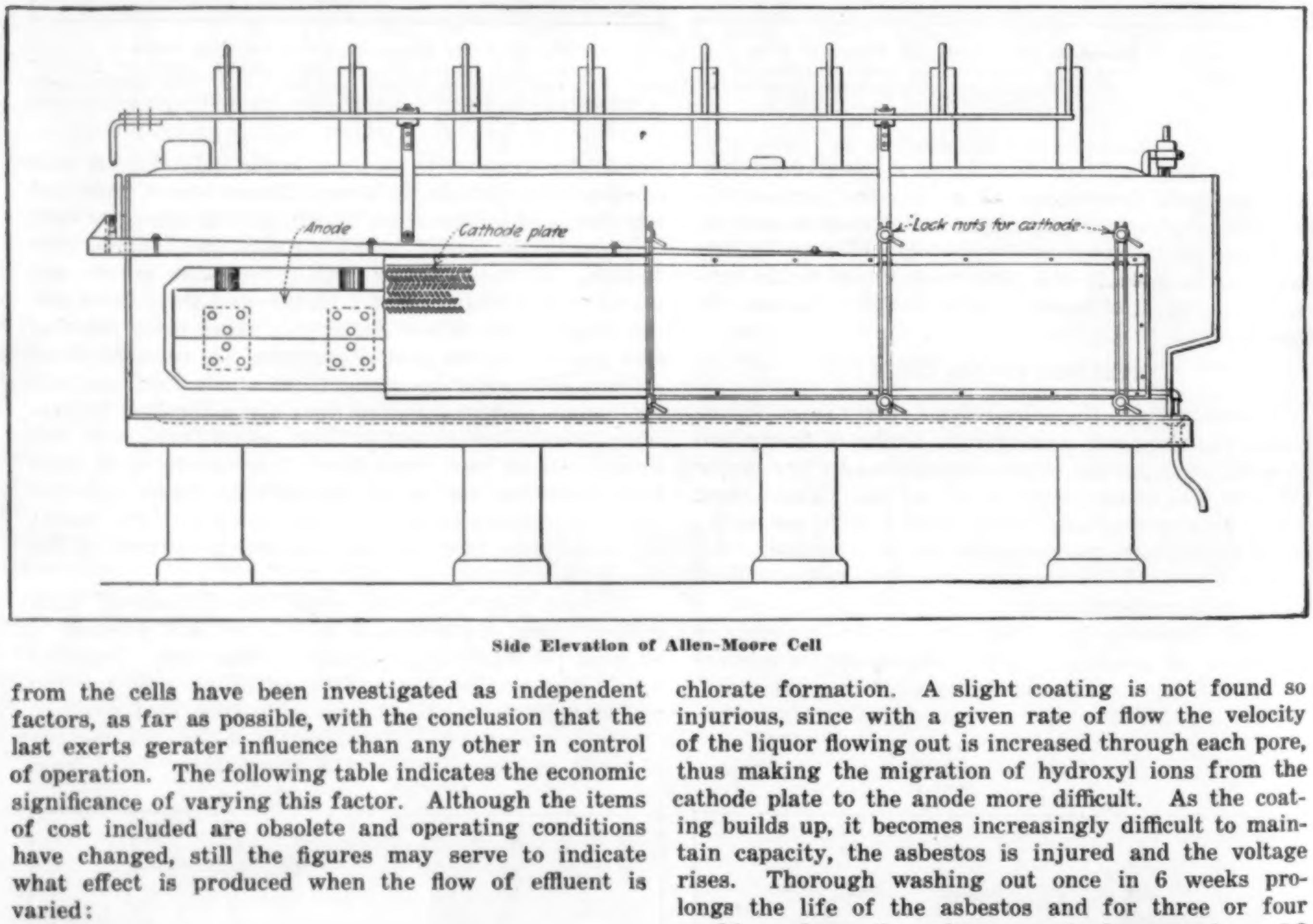
Much has been written about the operation of these cells, most especially by Hugh K. Moore, one of its inventors. (See *Chem. & Met.*, vol. 23, pp. 1011, 1072 and 1125). The Massachusetts Institute of Technology maintains a school of chemical engineering practice at this plant, and has done considerable work in an attempt to pave the way to still further improved operation. Current density, voltage, percentage of saturation and analysis of the brine, temperature and rate of effluent from the cells have been investigated as independent factors, as far as possible, with the conclusion that the last exerts gerater influence than any other in control of operation. The following table indicates the economic significance of varying this factor. Although the items of cost included are obsolete and operating conditions have changed, still the figures may serve to indicate what effect is produced when the flow of effluent is varied:

Effluent Flow Cu.Ft./Hr.	Cathode Energy Efficiency	Anode Energy Efficiency	Steam Used	Cost of Materials	Total Cost	Total Value
0.5	81.1	77.2	21,900	49.61	316.11	320.20
0.6	86.6	86.6	26,900	57.21	326.70	345.00
0.7	89.7	87.4	31,900	64.13	336.06	359.30
0.8	91.4	89.3	37,100	70.28	344.37	366.10

If the rate of flow is plotted against total cost and against total value, these figures indicate that optimum conditions exist when the flow is between 0.7 and 0.8 cu.ft. per hour. The variation in cost due to change in flow may be largely attributed to the change in percentages of salt decomposed as brine flow is increased. Naturally, if the flow through the cell is rapid, there is less time for breaking down than when it is slow, and for that reason the salt percentage in the effluent rises as the rate of flow is increased. Since any salt carried out in solution with the caustic must be removed, lowering the decomposition percentage results in a heavy burden for the evaporator. Power cost decreases with increasing dilution of the caustic in the effluent, but evaporation costs rise to offset this effect. Occasionally the demand in the plant for bleach is so high that it is necessary to push the cells; in this case the current density is deliberately run up and proportionately more liquor is put through without appreciably sacrificing economy of evaporator operation.

Difficulties of Operation

An outstanding difficulty in the operation of this type of cell is brought about by the coating that forms on the asbestos diaphragm, eventually making replacement necessary. This coating is caused by calcium and magnesium impurities to some extent, and likewise by chlorate formation. A slight coating is not found so injurious, since with a given rate of flow the velocity of the liquor flowing out is increased through each pore, thus making the migration of hydroxyl ions from the cathode plate to the anode more difficult. As the coating builds up, it becomes increasingly difficult to maintain capacity, the asbestos is injured and the voltage rises. Thorough washing out once in 6 weeks prolongs the life of the asbestos and for three or four washings drops the voltage required as much as 0.3 volt. After this, replacement becomes necessary (8.5-lb. sheet asbestos is required per cell). An Austrian investigator, Professor Billiter, has recently proposed the use of glass wool, impregnated with silicate, to be used in place of asbestos. While the author has not observed the results obtained with the new material, the suggestion appears a good one.



Side Elevation of Allen-Moore Cell

Evaporation of the Effluent

The cell effluent contains about 0.9 lb. of NaOH and 1.3 lb. of undecomposed salt per gallon. This flows in gutters to a sump and thence is pumped direct to a two-effect Zaremba evaporator—crystallizing type—equipped with three salt catchers. It is found necessary to evaporate to 50 deg. Bé. (6.25 lb. caustic soda per gal.) in order to remove the largest possible amount of salt.

Normally the evaporators are run on the batch principle. In 8 hours of operation it is found possible to handle all the liquor coming from the cell room in 24 hours. As used at this plant the evaporators serve a double purpose. Beyond the usual evaporation it has been found possible to use the second effect as a concentrator. Live steam is used in the first effect until the batch is concentrated to 46 deg. Bé., when the steam is turned directly into the steam chest of the second, which then becomes a concentrator. During the early part of the evaporation a pressure of 25 lb. is used in effect No. 1, while a vacuum of 26.5 in. of mercury is maintained in the second. For the concentration, effect No. 1 is shut down and the full heat of 15 lb. steam is realized in the second effect. Under these conditions an average coefficient of heat transfer for the two effects has been found to be 149 B.t.u. per hour per sq.ft. per deg. F. Approximately 9,300 lb. of water is evaporated per hour with an overall of 1.2 lb. of water evaporated per pound of steam. This latter figure includes all steam used for vacuum pumps, for washing reclaimed salt, etc.

Salt is thrown down by circulation and caught on the screens of Monel metal in the catchers under the evaporators. With three catchers it is possible to wash the contents of one while the two others are in the system. This is done with hot water and then with steam, the washings being run to a weak liquor storage tank and from there back to the first effect of the system. When as much of the caustic as possible has been washed out, the salt is taken up with hot condensate water and run back to the recirculation tank in the brine-making department. The reclaimed salt thus obtained carries less than 0.1 per cent of NaOH.

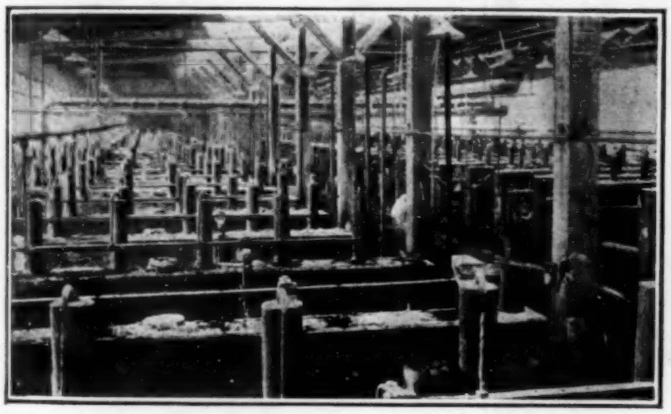


Fig. 5—Bird's-Eye View of the Entire Cell Room

Sixty-four cells, arranged in two banks of thirty-two each, are shown here. The main over cells on extreme right and left supply brine. The method of fastening busbar to anode is shown on the cell in the foreground.

When the liquor in the second effect has been concentrated sufficiently, it is run into one of three cooling tanks, where the small amount of remaing salt slime is allowed to settle out. It is then pumped to a storage tank, which feeds the caustic pot in which the evaporation is completed.

Caustic Fusion Department

The cast-iron pot used on this operation is of standard construction. It is directly fired with coal. The pot is filled at the beginning of the run with 51 deg. liquor from the evaporators, and as water boils off, more liquor is added to keep it full. Continued boiling drives off all the water until the pot has been filled with fused solids. The temperature is driven up to 850 deg. F. to burn out impurities and is then dropped to 675 deg., about 50 deg. above the freezing point of the fused caustic. The boiling down requires 60 hours as it is carried on here, the pot turning out about 19 tons per batch. Boil-overs, pouring spills and leaky drums are carefully guarded against, because of the hazard involved in handling molten caustic. A special siphon that is primed by suction is used for pouring the fused mass into the drums.

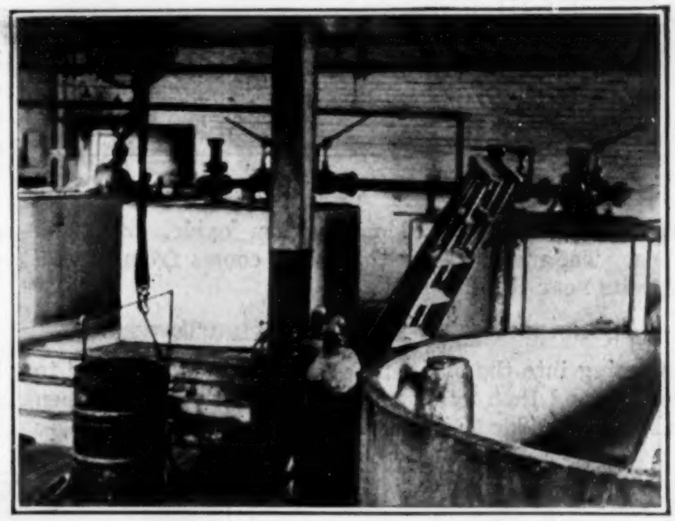


Fig. 6—Tops of Chlorine Absorption Towers

Lime sprays are arranged in these towers, each of which is divided vertically into two compartments by a baffle extending nearly to the top. A Sturtevant exhauster draws chlorine from the cells, up on one side and out on the other.

The drums used are made at the plant. It has been found possible to make a considerable saving in freight and storage space by this means. The sheets for the body come cut to size; the heads and bottoms are already stamped out. A small part of the time of one man is required to keep the plant supplied with the necessary containers.

Absorption of the Chlorine

The chlorine coming from the cells passes directly to the milk of lime absorption towers. The lime used is high in calcium oxide (96.5 per cent) and free from

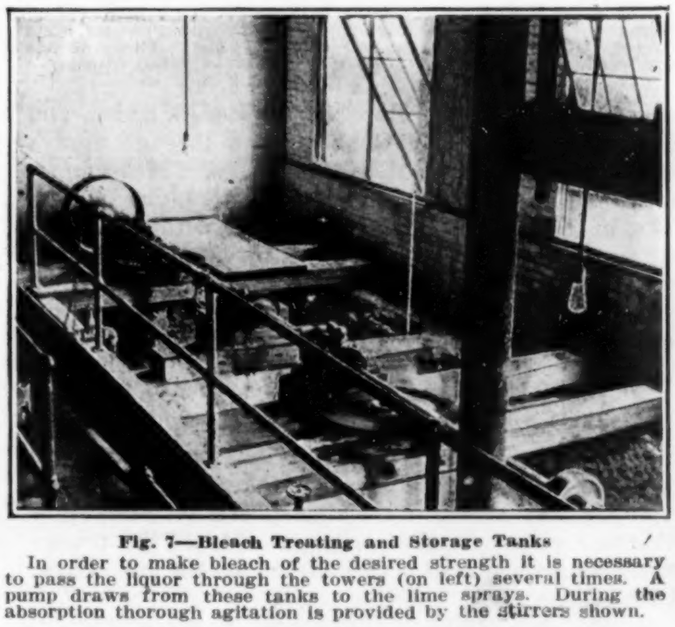
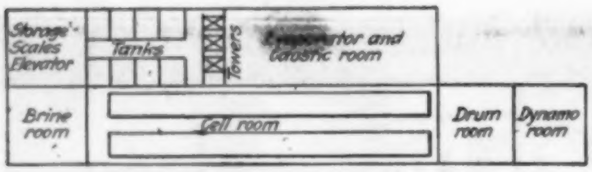


Fig. 7—Bleach Treating and Storage Tanks

In order to make bleach of the desired strength it is necessary to pass the liquor through the towers (on left) several times. A pump draws from these tanks to the lime sprays. During the absorption thorough agitation is provided by the stirrers shown.



Plant Layout Eastern Electrochemical Co.

appreciable amounts of magnesium oxide, iron and silica. The material for this plant comes from special deposits near Rockland, Me.

Construction of Bleach-Making Towers

Coming into the plant in box cars, this is conveyed to storage, and then by elevator to a slaking tank. When slaked it is added in computed amounts to one of six concrete mixing vats. Here more water is added, and the resulting milk of lime is pumped through sprays into the top of concrete absorbing towers. These towers, two of them, are 4 ft. square and 14 ft. high. A partition in the center of both reaching to within a couple of feet of the top divides each into what in effect is two towers. The chlorine is drawn up and down through first one tower and then the other while lime is being sprayed into the top of each division.

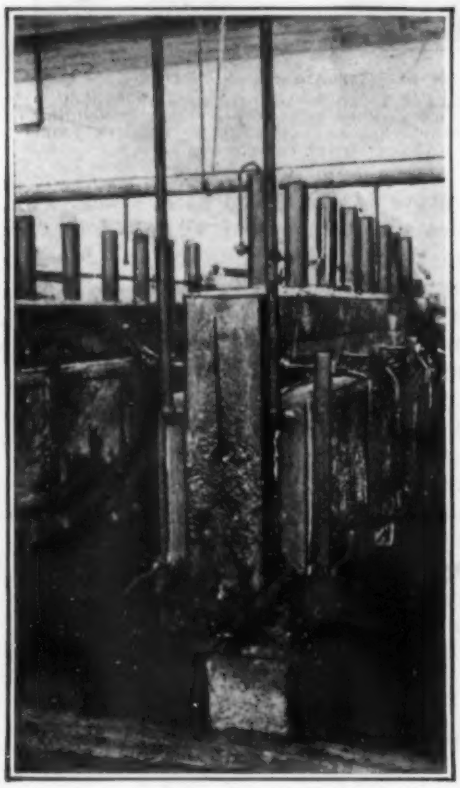


Fig. 8—Close-Up of Cell
End view shows outlets from cathode chambers to gutter handling caustic effluent. Upright pipes from cell conduct hydrogen to atmosphere.

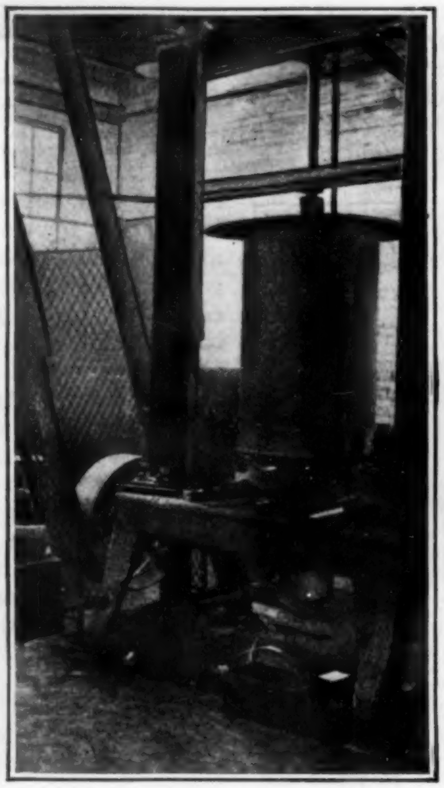


Fig. 9—Making Caustic Drums
One man working part time is able, with this and other simpler apparatus, to make all the drums required for shipment of fused caustic.

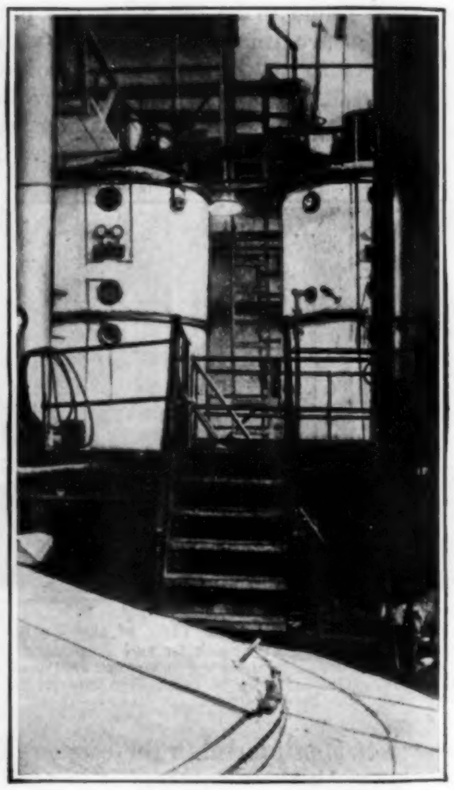


Fig. 10—Zaremba Caustic Evaporators
This two-effect machine, equipped with three salt catchers, is usually able to handle entire output of effluent in an 8-hour day.

Chlorine Is Completely Absorbed

The gas to the towers contains 15 to 20 per cent of chlorine, the remainder being air that has leaked into the main. Complete absorption takes place and the waste air is exhausted to the atmosphere. A Sturtevant exhauster placed on the waste gas side of the towers maintains a vacuum of ¼ in. of water on the gas system at the cells.

The liquor after passing through the towers flows back to the tank from which it came. It is then recirculated until nearly all the lime is converted by the chlorine into calcium hypochlorite. When this point is reached the tank is shut off and the remaining excess of lime is allowed to settle. The resulting bleach liquor shows ½ lb. hypochlorite per gallon, corresponding to a 5 deg. Bé. solution of 35 per cent bleaching powder. When clear, the bleach liquor is pumped to the pulp mill through a sand filter.

Overall Efficiency Is High

The overall efficiency for the plant indicates that only 5 per cent of the caustic formed is lost and that the chlorine efficiency on the same basis is 91 per cent. These figures are remarkably high and have been attained through most careful control of losses. These have been carefully analyzed to include the following: In the brine preparation department, leaky tanks, overflowing, washing sludges to sewer, filtration losses, pipes and valves; cell room, leaky cells, overflowing cells, improper washing of cells and changes of diaphragms; evaporation losses, leaky tanks, entrainment, leaks in steam chest and the solution of crystallized salt; in the tower, plugged spray nozzles and improper washing of sludges. Constant watch of these sources of loss made their elimination practically complete.

In the prepartion of this article assistance has been freely given by Stuart B. Copeland, general manager; Hugo H. Hanson, director of research, and Charles A. Blodgett, superintendent of the electrolytic plant, all of the Eastern Manufacturing Co., South Brewer, Me. Opportunity is here taken to acknowledge and to express appreciation of this co-operation.

Factors That Affect the Cost of Chilean Nitrate

A Criticism of the Department of Commerce Report by Bain and Mulliken on the Chilean Nitrate Industry

By I. Berkwood Hobsbawn
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TRADE Information Bulletin No. 170 (U. S. Department of Commerce) on the cost of Chilean Nitrate, by H. Foster Bain and H. S. Mulliken, has aroused considerable interest, especially in Chile. The producers have given the report the attention it merits, and many leading articles in the Chilean press have been devoted to an examination of the conclusions reached.

One question may be read between the lines—in regard to the statement that "the consumer of nitrogen is looking for the best way to spend his money." Will this be insured by the purchase of Chilean nitrate, to make good the deficiency in the domestic supply of nitrogenous materials, at prices fixed by the Chilean producer? Or should the consumer become a producer in Chile, and by sound technical methods of exploitation obtain nitrate at the lowest possible cost, even forcing the general prices down by sound competition and example? Or should the consumer manufacture nitrates or other nitrogenous products in his own country and thereby remain independent of Chile? These questions will doubtless be answered when all the reports authorized by the Congress of the United States, constituting an "Investigation of Raw Materials," are available. In the meantime, some of the conclusions reached by Dr. Bain might well be criticized because they deal with the vital question of possible operating costs in the manufacture of Chilean nitrate.

There can be no question that the continued efforts of nitrate technologists, aided by the excellent investigations of Prof. F. G. Donnan and the pioneer work of A. W. Allen, have at last aroused producers to a recognition of the value of modernizing the methods employed; and from all over the nitrate pampa come reports of modification and change. The first effect is noticed in the enlargement of existing plants and the construction of new ones of greater capacity. The value of consolidation has been recognized, and from that point to the introduction of adequate technical control and to the use of modern means of applying the recommendations made is not a great step.

Improved methods of mining the caliche will follow centralization of production; but in Dr. Bain's opinion the application of modern machinery for the purpose will be limited under the present system of manufacture and is not a factor of vital importance; this he infers will be true even when newer methods are employed, which would permit the exploitation of material of low grade. With Dr. Bain's opinion in this connection I find myself at variance. He says that "So long as enough labor can be found to work, according to the present methods, it will only be in exceptional places that money can be saved by introducing machinery." However, he cites that "in a specific case an increase of 37 per cent in output per day, from the same number of mines, was brought about by a more careful division of the work by introducing air drills for breaking boulders," and by the adoption of other labor-saving devices. The specific case quoted has been taken as exceptional, which it is not, and Dr. Bain has been led into error in assuming this. As a matter of fact, it is one of the few cases in which reform has been carried out, and it is probable that similar reorganization and the introduction of mechanical equipment will produce even better results in most oficinas, even under the conditions of hand sorting necessary to permit the application of the existing treatment process, known as the Shanks system. It is only in exceptional cases that money cannot be saved by the introduction of mechanical aids to mining.

Dr. Bain returns to the subject on p. 29, where he says that "It has already been indicated that so far as mining is concerned there does not seem to be any wide field for substituting machinery for men." He then eulogizes the Chilean workman; but the praise becomes less convincing when it is realized that he can increase his output considerably in September, to provide more money to spend in celebrating the national *fiesta*. The Chilean worker is doubtless all that Dr. Bain says he is, but he does not give his best by a wide margin. How can he? The housing and general conditions of life at a typical nitrate oficina are against conscientious effort. These conditions are now being remedied in many places; but they would scarcely be tolerated in any civilized community, and certainly not by anyone seeking the best from a workman.

Efficiency of Chilean Workmen

Dr. Bain says that "a much more highly paid workman would not deliver much, if any, more caliche from the same ground per day," but he omits to mention that a much more highly paid worker would deliver very much less caliche from the same ground per day. Obviously, if he can produce more per day in September, he could produce more per day in August or November; but he does not exert himself in those months because he only does enough to earn what he needs for his day's sustenance and to satisfy his exceedingly intemperate habits. He probably spends more on drink than any other worker in the world, and has less to show for his effort. Clothes, household goods, education—these things do not exist for him. Work, eat, drink and sleep—all under the most unhygienic of

conditions and with the merest gloss of civilization —comprise the essentials for his happy existence. The real fact is that, compared to what might be expected from this type of workman, he is already paid too highly. His output in tons is high, not because he works hard or for long hours, but because he has a comparatively easy job. He appreciates the work involved in mining a difficult *calichera* or quarry, which he will not tackle if he can help it; this accounts for the irregular workings on the pampa. Moreover, in bargaining for a price per cartload of caliche from a particular *calichera*, he knows how to make any easy *calichera* difficult, so as to obtain a higher price. The weakness of the whole system lies in the form of contract, or piecework, which Dr. Bain eulogizes so highly.

By a logical reorganization of the system of mining, even in a limited way, by the introduction of mechanical appliances, not only will the output per man be increased by 37 per cent or more, but the cost will be considerably decreased. When a lower average (say 10 per cent) raw material can be economically exploited, it would not be too much to say that modern drills, electric shovels and mechanical loading devices will so reduce the cost as to alter Dr. Bain's figures very considerably. Further, Dr. Bain's reference to payrolls that show averages of 25 and 26 days worked per month must be read carefully in view of the inaccuracy of much of the data obtained from a nitrate oficina.

Dealing with the question of recovery, Dr. Bain accepts as basic figures a minimum of 55 per cent and a maximum of 75 per cent nitrate from caliche from Shanks-process methods. One wonders whether Dr. Bain's figures are the results of his own investigations or whether they are obtained from the same sources that called forth the same criticism from Professor Donnan and others. I would prefer to take minimum figures at 45 per cent and to give a general average of 55 per cent recovery throghout the industry. A recovery of 75 per cent may have been reached at times, but the number of oficinas where this may have been achieved is so small that such results can have but little effect on the general average.

Dr. Bain says: "As to the possible effect on cost of consolidation and operation on a large scale, it may be pointed out that unless the system of mining be radically changed, and of that there is no large probability, the cost per ton cannot be affected very much, as it is so largely a direct labor cost. There is very little overhead to be reduced. Consolidation and larger units of production would require hauling caliche longer distances to the central plant. This should increase rather than decrease the transportation cost." Later he says: "It is true that as improvement in process comes to permit lower-grade caliche to be worked, and hence more tonnage to be worked, a decrease in transportation costs may be expected." In my opinion, the effects of consolidation and operation on a large scale on these items of cost would be much more far reaching than Dr. Bain's conclusions infer.

Transportation, as practiced in the best of the oficinas today, is woefully inefficient. An examination of the distribution of the costs of transport, such as are available, would lead to the conclusion that for the same expense twice or even three times the amount of material could be hauled. Consolidation and large-scale operation will permit efficient organization, properly designed tracks, an efficient repair shop and rolling stock, and a competent supervising engineering staff. These factors taken together will reduce the transport costs to a point out of all comparison with present-day figures.

Dr. Bain does not picture the industry as it really is—primitive in the extreme and only just awakening to the realization of its own primitiveness. Every phase of manufacture must be influenced considerably by larger-scale operations. Bigger and modern (double-stage) crushing plants, modern power installations and the proper generation and use of steam will appreciably reduce production costs; more careful supervision and technical administration will reduce, to an unbelievable degree, the present waste of fuel and raw material. Improved results will be the first indication of organized technical control. The possibilities of reducing fuel consumption, even in the present process, are such as to influence vitally Dr. Bain's figures of possible production costs. I do not take, as the base for this assertion, the possible fuel consumption any of process that has been or is being tested. The many evidences of fuel waste under existing conditions have been detailed by Professor Donnan in his report to the Association of Nitrate Producers of Chile, 1922. The badly erected and indifferently controlled boiler plants, the poor condition of maintenance, open-air evaporation and the absence of provision for the economizing of heat indicate opportunities in this direction.

Add to this the possibility, not remote, of increasing yield on the average from 55 to 90 per cent, and reducing the content of treatable raw material from 18 to 12 per cent of nitrate and there exists a truer picture of the future of the Chilean nitrate industry than that painted by Dr. Bain. There will be no need to stress this viewpoint before nitrate technologists, or before those technical men in the United States who have studied the nitrate industry of Chile personally or through the writings of those who have made themselves heard in the technical press.

Official Report Written Too Hastily

The particular fault I find with Dr. Bain's report is that it was too hastily written in regard to actual manufacture; and that he was led to generalize too much from the standpoint of the industrialist, who, one may venture to suggest, is non-technical and has had little operating experience. One would suppose from a study of this phase of the report that those students of nitrate technology, Professor Donnan, A. W. Allen, myself and many others, were not as truthful as they should have been when they denounced present technical methods of nitrate production in Chile.

The difficulties that stand in the way of rapid development of the methods in use and the rational replacement of the old plants owe their existence mainly to the absence of technical assistants and to the conservative tendency of the capitalists controlling the exploitation. Most of these difficulties will disappear when new capital enters the field to exploit a modified method of manufacture, with modern power, crushing and distribution plants, mechanical aids to mining, decent technical administration and large-scale operation. A careful study of the Chilean nitrate deposits and the nature of the raw material, followed by intelligent control, will lead to the conclusion that the reserves, possibly of several hundred years' commercial exploitation, offer what is probably the cheapest form of nitrogen available for world consumption.

Oxy-Acetylene Welding in the Process Equipment Field

Some Examples of the Spread of This Method for the Fabrication and Repair of Apparatus Used in the Chemical Engineering Industries

THE use of oxy-acetylene welding and cutting for the fabrication and repair of equipment used in chemical engineering processes has increased rapidly of late years. At the present time it is applied to such devices as stills, kettles, digesters, generators, nitrators, autoclaves, retorts, kilns, driers, coolers, absorbers, condensers, evaporators, separators, tanks, vats and piping. Those that have used this method have met with such success that the following summary of the experiences of the Linde Air Products Co. along this line is thoroughly worth the earnest attention of all chemical engineers.

Leaching and Dissolving Equipment

Whether a digester is stationary or rotary, it will be a better digester if it is a welded, one-piece container, rather than one built with riveted joints. Even when it handles materials and liquids that attack steel plate very slowly, it is found that preferential corrosion will attack the rivets unless a tight lining of glazed tile is installed. Welding construction ofttimes avoids this necessity—there are no rivets to corrode, to rub against the stirring mechanism or to loosen under heating and cooling strains.

Digesters, being closed vessels operating under temperature and pressure, should be constructed with every precaution for safety. This means that the welding

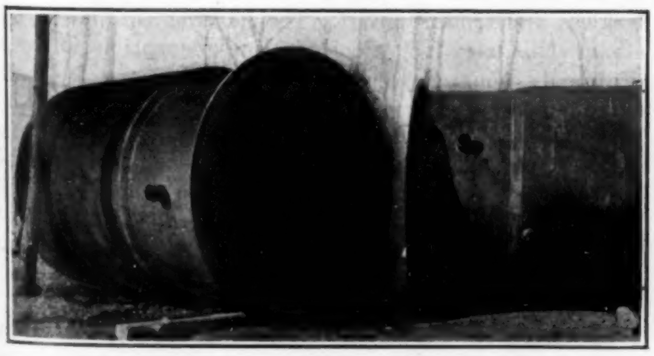


Fig. 1—Two All-Welded Digester Shells
Note the nipples welded to the shell body for pipe connections in place of the usual cast-iron saddles.

must be done by skilled workmen in shops that specialize in such equipment. Adequate tests under hydraulic pressure are also essential. That oxy-acetylene welds, properly made and properly tested, are absolutely safe has been demonstrated by years of practice. A double-V weld, made with proper welding rod by a skilled oxy-acetylene operator, will be stronger than the boiler plate or flange steel it joins. All manner of fittings may be attached to the digester by means of the oxy-acetylene process. Even after erection, a new pipe connection of any size can be laid out, the opening made with a cutting blowpipe and the new pipe welded in. That connection is forever after free from leaking packing, bolts or threads. A broken manhole cover, door, frame or fixture of any sort can of course be repaired with the oxy-acetylene welding at far less cost in time and money than would be required to procure a new one.

Jacketed kettles may be well made of welded sheet. In the past the size of jacketed equipment was strictly limited by the circumstance that it must be made of cast metal. It was impossible to use riveted steel construction, for it was impossible to make some of the close connections, and keep the others from leaking. This

Fig. 2—Top Plate of Internally Heated Vessel
Note the flanged connections for lead-lined pipe welded to this head. This picture shows how an existing piece of equipment can be remodeled easily by means of welding.

situation has been completely changed by the oxy-acetylene process. Seamless jackets can be built and surrounded by close-fitting jackets, with all joints permanently welded. Sizes are limited only by the strength of the sheet metal employed and the limits of the design.

The cutting and welding torch is first aid in keeping all such equipment in operation. If failure occurs in some apparently inaccessible place, the skilled operator will know how to cut away a sufficient portion of the jacket to reach the break, which is then repaired and the opening rewelded. Here again is an indication of the situation where the service operator's advice will save the oxy-acetylene user a large amount of money and inconvenience.

Other equipment of the same general type is constructed for mixing chemicals and inducing chemical reactions, sometimes at high temperatures and pressures. Much welding can be done on them to advantage. Many leaching or digesting operations demand vessels or vats made of metal or alloys other than iron or steel. Sheet copper is the old standby. It can be successfully welded with the oxy-acetylene flame at a much higher speed than is possible with the coppersmith's gas torch. In fact, the blowpipe is able to join so many of the non-ferrous alloys, such as aluminum, Monel metal and lead, that equipment made of them is now commonplace, equipment of a form which only a short time ago was considered practicable only in steel and cast iron.

The man who must handle commercial quantities of

pure, hot substances, and avoid the least contamination of any sort, can now rely upon the oxy-acetylene process to fabricate equipment of that particular alloy which suits his requirements best—equipment that is not only tight at the start but that remains permanently tight because it is jointless. There will never be a necessity for calking, brazing or reriveting to bring the equipment back into service. Extra bulk, weight and cost are eliminated, and intricate forms may be constructed which formerly were impossible except to a glass blower.

Distillation Equipment

A still is distinguished from a digester more by its use than by its form or construction. Therefore much that has been previously said about the advantages of oxy-acetylene welding in the manufacture and maintenance of digesters applies with equal force to that of stills. In the petroleum industry it is essential that stills be mounted in a furnace setting so that no lap joints are exposed to direct heat, because tarry substances and coke left behind have a tendency to accumulate on such rough spots. This blankets off the heat transfer and causes rapid overheating, severe buckling and damage to the plates. Therefore the largest sheets that can be secured are always used on the bottoms of these stills. Such facts in themselves form the best possible argument for the all-welded still, even when it is in the form of a plain cylinder with dished ends. Add to this the fact that any other joint will inevitably loosen up and leak after a moderate number of temperature reversals, and the case for the welded joint is complete. Complex forms are more easily made by cutting and welding blowpipes than by any other tool, so the added advantage of economy is more evident. It will bear repeating, however, that welding on pressure vessels is not to be trusted to a beginner.

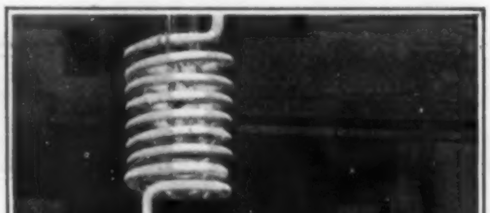


Fig. 3—Special Still With Welded Condensing Coils

Welding presents an easy and satisfactory method of fabricating such devices, eliminating the possibility of the leaks so prevalent with coils made up from flanged pipe bends.

Stills of non-ferrous metals, particularly of copper and aluminum, are commonly welded, and for the same reasons outlined under the heading "digesters." Bolted connections are provided only where it is necessary to disconnect parts at frequent intervals during operation. The ease and satisfaction attending the fabrication of heavy sheet aluminum have done much to extend the use of this metal in industrial plants handling chemical solutions or food products.

Many stills have internal coils for superheated steam. Some coils are perforated and steam blows into the liquid being heated. The oxy-acetylene flame has been the most successful method used in the manufacture of such coils: intricate layouts can be constructed in almost any commercial metal or alloy to fit any conceivable situation. Outline sketches and overall dimensions only are required. Pipe may then be welded end to end and suitably heated by the oxy-acetylene blowpipe for bending at any point where a bend may be necessary. Coils may also be welded in at their entrance and exit to the still, thus giving a continuous tube—jointless, leakless and trouble proof. The heating equipment for steam stills used in typical gasoline absorption plants is ordinarily constructed on the job with oxy-acetylene cutting and welding blowpipes. It consists of a 10-in. header lengthwise along both sides of the still, from each of which perhaps twenty pipes lead, entering the still near the top and ending in a spray-nozzle. In such stills the contents are heated by steam blown right into the liquid. Heating coils made of copper, brass, aluminum or lead are also commonly used to avoid contamination of substances by dissolved metal.

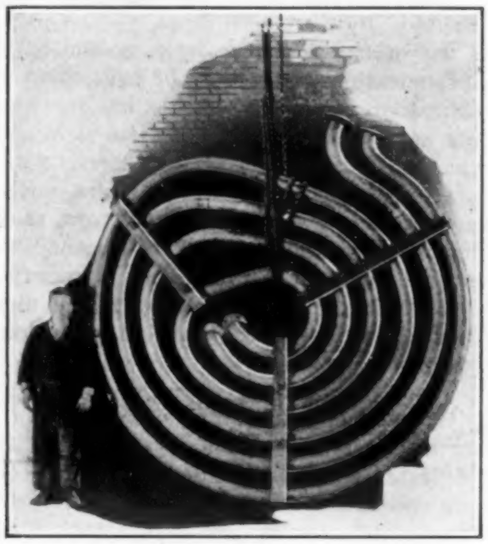


Fig. 4—Welded Copper Coil for Heating Kettle

Horizontal coils of this type can be economically made on the job by the use of oxy-acetylene welding equipment.

Brazing with the oxy-acetylene welding blowpipe is a very simple operation, and is used with good effect by maintenance men in industrial plants. As an instance, defective heating coils in some stills for solvent recovery were replaced by coils made of reclaimed brass and condenser tubing, brazed together. These coils had to be sectionalized so they could be taken into the stills through a manhole. At intervals of about 2 years the brazing failed by pitting, but it was a simple matter to remove the coils, rebraze the pipe and reinstall. (Welding was done on the outside on account of the disagreeable zinc fumes generated by the operation.)

Being in actual contact with flame, the retort must be made of material that will not warp (which restricts steel vessels to comparatively low temperature), and one that does not scale and waste away. Cast iron has been

used for such purposes for many years; special heat-resisting alloys are now being installed where conditions warrant the extra first cost. An exception to the general rule that steel is not used in high-temperature distillations is found in the construction of many oil-cracking furnaces. Crude oil passing through is heated while at 80 lb. pressure and broken up into gasoline and fuel oil. A single furnace may include 240 lengths of 2-in. extra-heavy seamless tubing. Cast-steel return bends are welded on the ends, making a leak-proof system that remains tight after 2 years of constant service.

The use of the oxy-acetylene flame on heavy cast-iron retorts and pots is confined to the repair of defective castings. Defects may be discovered and corrected in the foundry, or may develop after the vessel has been in

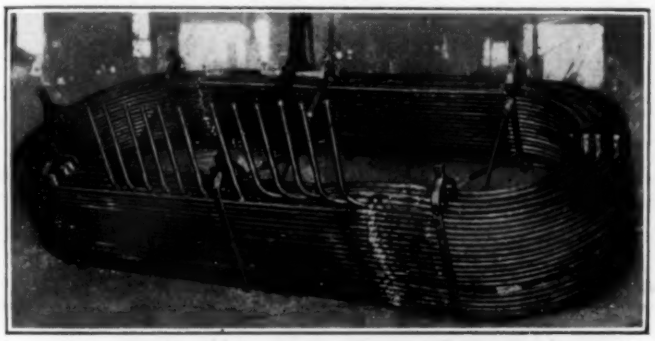


Fig. 5—All-welded Coil for a Large Heating Vessel

This coil, containing more than 3,000 ft. of copper pipe, is made throughout by welding, resulting in a much more compact and satisfactory job than could be obtained otherwise.

use for a certain time. If corrosion or rubbing from a stirring mechanism has damaged the bottom, it often proves cheaper to cut off the damaged section and weld on a new bottom rather than buy an entirely new casting. Minor repairs are more easily made, often without removing the casting from its setting. Broken lugs, cracked flanges or frozen bolts are a few of the many places where the oxy-acetylene process may be effectively used.

Rotary kilns differ from retorts in that the contents are heated by direct contact with the flame. In their modern development they consist of huge rotating tubes of steel plate lined with firebrick, one end slightly higher than the other, so material in process works its way toward and out the hot end. Even the largest of such equipment may be successfully welded. A kiln for the manufacture of carbide so heavy and long that it had to be loaded on three flat cars was made to a tolerance of ½ in. in diameter, well within the limit for the older riveted construction. It is expected that it will require negligible maintenance charges, for there are no rivets in it to loosen under the alternations of stress and temperature.

Rotary driers look much like kilns in outer form. They ordinarily have interior cylinders or shelves so arranged that material works back and forth or is repeatedly poured through a current of heated air. They may be made in the same way by the use of welding. Vacuum driers of the same cylindrical outer shape have been made in considerable numbers, up to 9 ft. outside diameter and 50 ft. in length. In one design this outer shell surrounds another slightly smaller one. Both these cylinders are made of at least ½-in. plate entirely welded with the oxy-acetylene flame.

In absorbers a great variety of designs are in use, ranging widely in complexity. But whenever metal is used in their construction, the oxy-acetylene process will be found of great value in their fabrication and maintenance. For instance, a simple absorber for ammonia gas, liberated from a distillation, consists of a cylindrical tank placed horizontally and partly filled with water. A large percentage of ammonia was lost when using this design. This situation was corrected by welding a number of branches into the gas pipe in each absorber and cutting them off on the same level, thus distributing the gas stream between many outlets. More complex towers and scrubbers are common. The welding blowpipe is used to join the pipe outlets and many of the joints. A considerable amount of welding may also be done on the interior of the towers and absorbers; for instance, on the trays. Finally, it may be mentioned that welded gasoline absorption towers, up to 48-in. diameter and 60 ft. long, are standard equipment in casing-head gas plants.

Piping

One of the most prolific sources of usefulness for oxy-acetylene welding and cutting is its application to the piping problems in an industrial plant. It is capable of simplifying greatly the engineering and operating difficulties associated with the movement of large quantities of valuable fluids. As these are frequently more or less corrosive, they steadily work their way through screwed connections, stuffing boxes, gaskets and packing, and keep a squad of pipe fitters busy. Nothing is more logical, then, than that a progressive management should insist on pipe layouts that are jointless and therefore

Fig. 6—Placing a Bottom Outlet on a Solid Cast-Iron Pot

Alterations of this type can be quickly and cheaply made on the job by the use of oxy-acetylene welding equipment.

leakproof—that is to say, oxy-acetylene welded. Oxy-acetylene welded trunk lines carrying natural gas and petroleum products have become standard in the oil industry. Welded steam headers for boiler plants are specified in more than half the new installations. Welded specials are easy to make and are much cheaper than cast fittings. Close connections required by congested places can be made by welding connections that could not be made with standard fittings.

Intricate piping layouts are not necessary before oxy-acetylene welding becomes economical. This is demonstrated by the use of the process in carbon-black plants. Despite the fact that the life of a carbon-black plant is relatively short and portable construction desirable, the gas piping is welded throughout to save the multitude of fittings otherwise necessary. No matter how well de-

signed a piping system, operations always develop places where it might be altered to advanatge. Here again oxy-acetylene cutting and welding is the most economical method of making the change. If a good welder is on the job, needed additions can be made immediately after their necessity is discovered. For instance, it is practice to pass wash solutions through "sight boxes" where their clarity may be easily observed. At one plant these solutions contained some very volatile fractions, and important losses were sustained until the leaks were tightened up with the oxy-acetylene welding torch, and a small exhaust pipe provided.

When handling thick fluids, like tar, asphalt or paraffine, it is necessary to steam-jacket all piping, else the hot contents cool off and get too stiff to flow. Nothing is more difficult to maintain than steam-jacketed pipe built with stuffing boxes and screwed fittings. On the other hand the same thing made with the aid of oxy-acetylene welding is very simple. As many lengths of the line pipe may be welded together, end to end, as can be conveniently handled. Then at intervals little pads are built up of weld metal on the outside of this pipe; these pads act as spacers, bearing against the inside wall of the jacket pipe, centering it properly. Then a corresponding length of larger diameter pipe is slipped over the first, the ends heated with the oxy-acetylene flame, hammered down to close up the annular space, and then welded all around. An inlet and an outlet is welded into the jacket at each end for the live steam, and a drip at the low spot for condensate.

Piping for concentrated acid is a source of trouble

Fig. 7—All-Welded Evaporator

Note the welded shell, tubes welded into header plates and header plates welded to shell. Such a structure is absolutely tight and is unaffected by expansion and contraction.

and expense at the very best, and this trouble ordinarily develops at the ends where the pipe wall is much reduced by threading. A large oil refinery has eliminated joint trouble by erecting 1,500 ft. of 4-in. pipe as follows: All bends were cut on a miter and welded in the shop. Straight lengths were flanged, but the flanges were "home-made" with the cutting blowpipes, using scrap $\frac{3}{8}$-in. boiler plate. After these were properly punched they were welded on the pipe. (These flanged connections were made to facilitate removal of any corroded lengths as they appear. Ordinarily, an all-welded line would have been used, and any leaky places cut out very easily with the oxy-acetylene torch, but the line in question traversed a portion of the refinery where open fires and lights are taboo.) Second-hand pipe was used in this line; some of it corroded on the outside so deeply that it would have been impossible to cut a new thread on the end, or salvage it in any other way.

Many liquids cannot be handled in ordinary pipes, due to their rapid action on iron. For instance, tannin solutions in leather tanneries are ruined by contact with iron, forming a black, inky substance. Aluminum pipe, made of drawn sheet, has been used with signal success in such places, but unfortunately the cast fittings are often porous, always expensive, and sometimes made of an alloy that corrodes badly. Furthermore, the threads reduce the effective life of the pipe. This situation is met by the oxy-acetylene process. Drawn aluminum piping can be welded easily end to end, and specials are

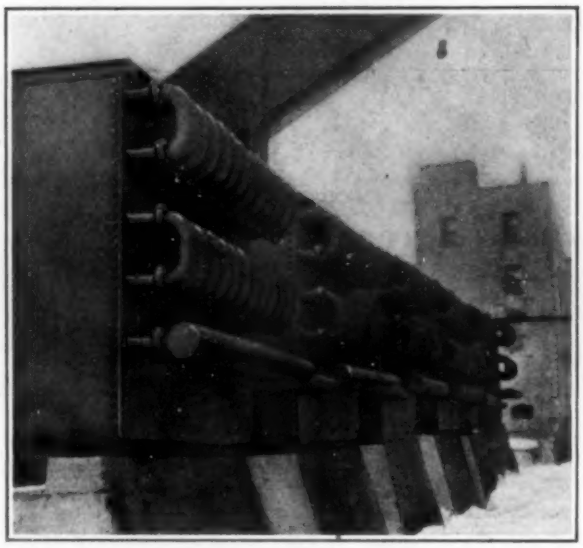


Fig. 8—One Way of Making End Connections for a Condenser

This plant had a large number of cast-iron return bends with flanged connections on hand, so short nipples and companion flanges were attached to each and the nipples then welded to the proper condenser tubes.

easily fabricated by welding. Joints tested to destruction indicate that the weld-metal remains sound and leakproof even after serious distortion. The welded joint is far stronger than a cast-aluminum fitting, it is absolutely tight, uses less material and is cheaper to install. Similar remarks might be made about the copper piping used extensively in industry.

Condensers and Evaporators

Condensers are a prolific source of losses. Unless they are carefully designed, constructed and maintained, a series of troubles follows one upon another. Uncondensed vapor will escape if the cooling surface is not great enough. A leaky coil will either lose valuable liquid or dilute it with dirty water. Consequently any scheme that removes trouble in the condensers removes many worries from the operating staff.

One plant has gone to the extent of eliminating all submerged screw joints. In times past all condensers were submerged coils. Failure ordinarily occurred at a cracked thread. The condenser would be drained, and when a workman started to open up the nearest flanged joint he would find the bolts frozen. These would be sledged loose, whereupon all the flanges in the whole coil would start leaking. The result was that leaky coils would be endured to the limit and then the condenser shut down and entirely rebuilt. At present, in standard design, the piping passes clear through the condenser and all joints are on the outside and are welded.

Headers for the beginning and end of these coils are also made with the aid of the oxy-acetylene process. A piece of pipe of suitable size and length is selected, and short nipples welded into a series of holes cut at the proper distance center to center. It will usually be found that the header after manufacture will be warped out of line. This warping may be minimized by clamping the header during cutting and welding to a heavy I-beam or another piece of pipe. After release, any spring that may appear may be counteracted by heating with the welding blowpipe at spots on the back side of the header opposite where the connections are made. It is almost impossible to weld a series of branches or inlets into a header so that the ends will line up exactly. They will always be slightly out of center or out of plane. With good careful work, however, the outlets will fit close enough to the condenser piping so that good welds can be made.

Condensers such as these will last until the pipe is perforated by corrosion. This will take far longer than with ordinary pipe joints, because no threads exist, cutting their way half through the pipe wall at the outset. Should a leak develop in any string of pipe, it can easily

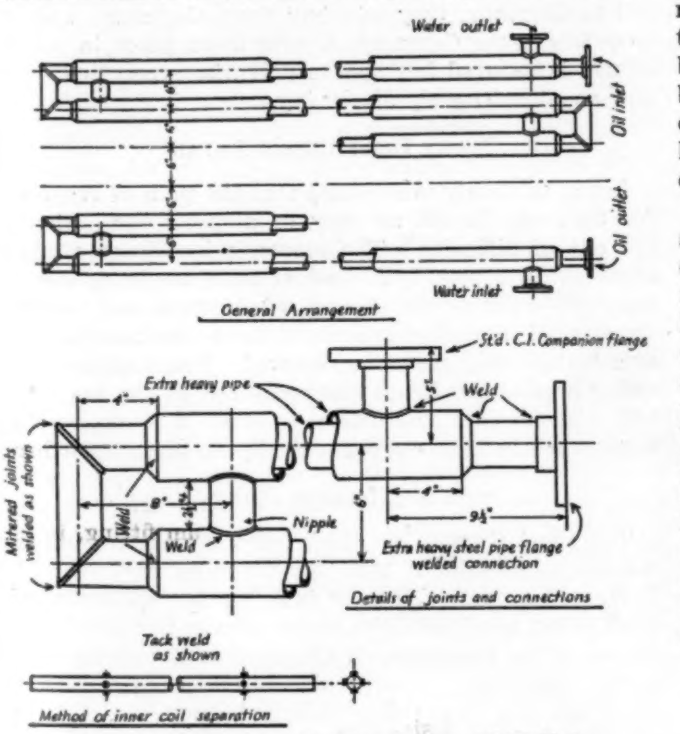


Fig. 9—Standard Construction for an All-Welded Cotton-Oil Cooler

This construction, by eliminating many joints which developed leaks despite continual care, has proved a great saver of time and expense.

be blanked off, leaving the rest of the condenser in operation. The first time the tank is dry, the leak can be welded with a long-handled blowpipe; or if desired the pipe can be removed and a new one inserted. More elaborate condensers are built along the lines of a surface condenser. These also can best be made with welded construction.

Double and triple effect evaporators have many elements in common with condensers, and can be made by welding in the same way. Such a structure is not affected by expansion and contraction, and is absolutely tight under all conditions of use. Oxy-acetylene cutting and welding stations are first aid in repairing such equipment. Leaky tubes can be removed, new ends welded or brazed on, or new outlets or inlets made in a hurry.

Carrying this type of apparatus a little further, we find heat interchangers, recuperators and certain varieties of coolers. Modern evaporators are essentially heat interchangers. However, much simpler but very efficient interchangers are made from standard pipe with oxy-acetylene equipment. Simple coolers have been installed in a Southern plant for cooling cotton oil. The construction is very similar to that for steam-jacketed piping. The coils contain six 20-ft. lengths of 2-in. extra-heavy pipe, each jacketed by 3-in. extra-heavy pipe. This new construction replaces similar coils made with special fittings and ground flanges, joints that continually developed expensive leaks despite the utmost care. The welded coils were not only absolutely tight but actually cheaper to make.

Storage Tanks

The desirability of having an all-welded storage tank is the same as that for jointless piping—namely, absolute tightness and avoidance of all losses from leakage and evaporation. To illustrate their practicability, it may be noted that storage tanks, welded throughout by the oxy-acetylene process, have been built in great numbers up to and including 1,000-bbl. capacity. Floating bell gas holders of 50,000 cu.ft. capacity have been erected by oxy-acetylene welding, and are giving absolute satisfaction. The use of welded piping for heating coils in heavy oil storage also needs no further attention.

It is not necessary, however, to wait until a new storage tank is to be bought in order to profit from the ownership of a welding station. Old stills may be taken from scrap, cleaned out, patches welded into the manholes, thin spots reinforced, and necessary inlets and outlets attached, and you have a thoroughly acceptable storage tank. Or old settling tanks may be butted together, top to top, and a circumferential weld made. You then have a long cylindrical tank with conical ends. Numbers of such expedients are obvious; a relatively large storage volume can be provided cheaply by mounting several items of this reclaimed equipment on suitable foundations and welding plenty of cross-connecting pipes. It may be remarked, as a practical matter, that is is usually desirable to set such interconnected miscellaneous tankage with the tops at a level.

Other Applications

In experimental work the ability to make alterations quickly is of extreme importance. Jobs that would ordinarily involve much labor and expense may be quite simply done when it is only a matter of cutting a hole with a blowpipe and then welding in new connections. Such jobs, of course, can be done on the site without having recourse to a rigger's gang for moving the apparatus into a well-equipped foundry and machine shop. With oxy-acetylene equipment it takes ordinarily but a few minutes time to install a gage or other instrument wherever desired.

A very important use of the process is in repair work. A rather complicated piece of equipment is sometimes rendered useless because of one corroded spot, a leaky joint or cracked seam. With the welding blowpipe, repairs take only a few minutes, they can be effected on any of the metals in use, and ordinarily with no dismantling of the equipment and little loss of time.

Small experimental apparatus used in connection with

research work usually resolves itself into an assemblage of tanks, columns and piping, and it can usually be found that anything needed can be made from standard steel pipe. For instance, if a small pressure tank is needed, take a piece of 18-in. or 24-in. pipe, cut out two sections for rounded ends, and weld the whole thing together with any necessary coils, baffles or trays on the inside, and there results a vessel good for as much pressure as the original pipe. Packed columns are as simply made from welded pipe with welded connections. If traps, conical bottom receivers or special reducers are needed, the oxy-acetylene flame makes them quickly, efficiently and cheaply from ordinary pipe.

Germany's Revival

Hope and Financial Soundness Have Replaced Despair and Inflation

By E. J. Mehren
Vice-President, McGraw-Hill Co., Inc.

NO COUNTRY in the world today is, from the economic viewpoint, so interesting as Germany. She occupies the spotlight in Europe. What is to be her future is the question that everyone in the Old World is asking.

The answer to that question no one can tell. The problem is complicated. But this even the casual visitor to Germany can say: Germany has made tremendous strides since the war; she is showing extraordinary recuperative power—against tremendous handicaps; she has worked a financial miracle since November of last year; and, finally, no nation that shows Germany's potential strength can be permanently kept down, can be crushed.

These observations, let me repeat, even the casual visitor must make. The signs are written everywhere: in a people again well nourished, in a public administrative ability (irrespective of party) that was able without new revolution to stabilize the currency, in a returning hope that Germany can again rise. There is not buoyancy of spirit, but there is a deep-founded confidence that the nation is not going to pieces.

The situation is in sharp contrast to what one expects. In America we hear of the wrecking of the currency, of the sufferings of last winter, of the difficulties under which her industries labor in securing raw materials and finding markets. Upon these reports—which, of course, are correct—we paint with our imaginations a country on the verge of despair, a disrupted industry, a tottering government. The surprise is a great one—and, if one is fairminded, he must come away with deep admiration for what has been accomplished.

Germany's Handicaps

Let us briefly paint the picture of Germany's economic circumstances:

Under the Versailles treaty or as a result of it she lost heavily of her iron and coal deposits—in Alsace-Lorraine, the Saar and upper Silesia; she lost her colonies, her foreign investments, her shipping, her export organization and its connections; she has a large part of her territory under the control of her former enemies. In addition she has been through an exhausting war and a political revolution.

These conditions are not new; they existed when I was in Germany just 4 years ago, in the summer of 1920. The result was what might have been expected—an underfed, discontented people, a disorganized industry and an all-pervading discouragement, unrelieved by any ray of hope.

Since then, since 1920, two other financial disasters have forced themselves into the picture—the occupation of the great industrial district of the Ruhr and the wrecking of the currency. With these added calamities one should logically expect that conditions would be worse instead of better, that the despair would be even blacker than before.

And yet conditions are as I have described—immeasurably better. Here is a nation on the upgrade, rather than the down. Here is a nation to be reckoned with economically, not to be ignored; here is a nation that is sure to be an important factor in the world's industry.

This last is a bold statement. I realize what terrific handicaps the rest of the world can put upon Germany if it wishes. It can keep Germany impotent, but it is my belief that it will not do so. Sentiment, moreover, will play no part; commercial considerations alone will lead to trading with Germany. Other nations will want to sell to the markets of a reviving Germany. If they sell to Germany, they will buy from Germany; and if they buy from Germany, a prominent place in world affairs is assured her by the potential strength she is now so conspicuously displaying.

Many Difficulties Ahead

Let it be clearly understood that the path of recovery for Germany is not an easy or a quick one. She is not out of difficulty. The economic handicaps recited above are still upon her; some of them are being slowly removed—such as the absence of shipping and foreign commercial connections; some of them—such as the lack of colonies—may never be removed. But a nation that under present handicaps has recovered as she has done will rise despite the obstacles that a commercially minded world is likely permanently to place upon her.

The Turning Point

The great German economic miracle was wrought in the closing months of 1923 and the early part of 1924. Early last autumn Germany truly, to use the words of Basil Miles, administrative commissioner for the United States in the International Chamber of Commerce, was at the crossroads. Directly ahead—on the road she was traveling, the road of unbalanced budgets, of state subsidy of the railroads, of currency debasement—was revolution, industrial suicide, destruction. To the right was a stormy path, extremely difficult, beset possibly by disorder, possibly by revolution, but leading, if the difficulties could be mastered, to economic soundness. It was the road of a stabilized currency, with its accompaniments of balanced budgets and governmental economy. Germany chose to go to the right, to take the difficult road, to bear the stress of financial reform and currency stabilization. She did it at a time, too, when the situation in the Ruhr was at its most critical stage, when strong forces were seeking to pry loose the Rhineland and erect it into an independent state, when the attitude of Bavaria toward the rest of Germany was much in doubt. But she went on nevertheless. The government declared that the mark should be stabilized at 4 trillion 200 billion to the dollar. There was a severe contest with the mark speculators, but by severe measures the government won, and since Novem-

ber, 1923, legally, and about Jan. 1, actually, the rentenmark has stood at 23.8 cents to the dollar. There was no revolution.

That achievement marked the turn. It showed the return of administrative strength in the German Government. It restored business to a sound basis. It killed speculation and the orgy of spending. It restored the incentive to save and therefore to work. It marked the end of the crisis in the economic and social disease and the beginning of recovery.

Germany is beyond the crossroads and has chosen rightly. The future is long and difficult, but there is health where there was disease, there is hope where there was despair.

Some Details Briefly Told

Let me now add some details—briefly. They will help to an understanding of the situation. Each item deserves elaboration, but that would take much space.

The severest present industrial handicap is lack of credit. The great credit reservoirs were nearly or entirely wiped out by the fall of the mark. Further, there was no incentive to save; industries and individuals converted the tobogganing mark into goods as quickly as possible. Today the credit resources of the banks is estimated at one-tenth the pre-war amount. When credits are obtained the interest rate is 2½ per cent per month for the very best security.

There is a terrific money shortage, which also curtails business, for with lack of credit everyone tries to insist on cash on delivery.

Wages are at approximately pre-war level. Prices, as of July 15 (according to the *Frankfurter Zeitung* index, the highest index I could find and which takes in ninety-eight commodities) are 34 per cent above 1913. (The government's index for wholesale prices is 12 per cent above 1913.)

Efficiency of Labor Increasing

Efficiency of labor has increased notably and is still increasing. I heard no general complaint against the workingman in Germany as I did in England.

Unemployment, while fairly large just now, is not as great as that of Great Britain, and does not present the all-engrossing problem in Germany that it does in the British Isles.

The works councils, elected by the workers, are said by the employers to be a good influence. They help smooth out difficulties and, in general, have not been radical.

Hours of work per day are increasing.

The coal supply, which by its shortage was expected to be for many years a serious handicap to German industry, is now more than ample on account of the very large development of lignite deposits.

Taxes Yield Good Revenue

The heavy taxes imposed on industry and individuals are beginning, under the stabilized rentenmark, to yield a good revenue. Recent figures show a surplus that has been used to retire obligations.

There is much more to be said and the details just given need elaboration. But these few particulars will help to fill out the picture as I saw it—the picture of an industrial nation again on a sound basis, well organized, confident that somehow it will work out its difficulties and again will play a part in the world of industry and commerce.

Willard Devulcanizing Process for Reclaiming Rubber

The operation is announced of a commercial demonstration plant at San Diego, Calif., which is successfully devulcanizing 200 lb. per day of scrap rubber by the Willard process, the invention of C. F. Willard. The process, which is covered by patents in the United States, Great Britain, France, Belgium, Norway, Germany and other European countries, provides for the true devulcanizing of vulcanized waste rubber by the removal of the vulcanizing agent, whether it be sulphur or any other sulphur compound, and the restoration of the rubber to its pre-vulcanized condition. Ostwald maintains that the vulcanizing of rubber is an instance of irreversible adsorption. The practicability of the Willard process tends to disprove this. A substitute medium is used, which adsorbs the sulphur upon release at a temperature above that reached when the rubber was vulcanized.

The average heat used in vulcanizing rubber is about 287 deg. F. The melting point of sulphur is 239 deg. F. Thus sulphur is melted and its fumes penetrate the honeycomb structure of the rubber, which in reality acts as a disperse phase, the dispersion of which is increased by heat long before the point is reached when vulcanization take place. Hence it is maintined that the usual methods of devulcanization, or rather reclaiming, by heating the rubber in an aqueous solution of caustics, to destroy the fiber of the fabric, at a pressure of 125 to 130 lb. of steam, equivalent to about 360 deg. F., does not devulcanize the rubber by removal of the vulcanizing agent, but merely plasticizes it so that it can be used again, as an adulterant or "extender" in association with a larger proportion of fresh crude rubber. Such reclaimed rubber may contain more combined sulphur before than after the operation, because when the temperature of the waste material is raised, the sulphur is retained and is readsorbed again on cooling, additional free sulphur being adsorbed under the new conditions.

In the Willard process an emulsoid colloid solution is used, alone or combined with a sulphur solvent acting as a substitute adsorbent in the place of the sulphur to which it is transferred and from which it can be removed by a detergent or cleansing solution.

The scope of the Willard process is such that it is claimed that rubber devulcanized thus can be used for every purpose for which new rubber has previously been considered essential. Being soluble in commercial rubber solvents, it can be used satisfactorily for goods that are dipped or on which the coating is spread, for which the ordinary reclaimed rubber is not available. A successful use of devulcanized rubber is seen in the manufacture of auto-top dressing. Most products in this class are made from shellac, alcohol and lampblack. As the alcohol evaporates, the covering cracks. By using a solution of rubber, the volatile elements evaporate and a thin film of rubber remains that acts as an effective waterproof coating.

A further use for such devulcanized rubber is seen as a substitute for some of the constituents of ordinary paint, especially where this is exposed to a salty atmosphere.

An additional feature of interest in the Willard process is that the waste rubber can be devulcanized without destruction of any fiber with which it may be associated.

A Modern Power Plant That Needs Soft Water
Double compound Mallet locomotive, a giant whose efficiency is greatly impaired if its boiler water is not purified

How the Chemical Engineer Tackles

The Water Problems of a Railroad

The Elimination of Scale-Forming Solids and the Simultaneous Production of Non-Foaming Water All Over a Railroad System Is a Major Technical Problem

By William M. Barr
Consulting Chemist, Union Pacific Railroad, Omaha, Neb.

TO THE theoretical chemist the whole explanation of water treatment may be written in a few equations, most of which involve the precipitation of calcium carbonate. But like most reactions, they are reversible and their velocity depends much on the temperature and pressure at which they take place.

Consider, then, what factors force their way into this problem when the temperatures vary from —37 to +193 deg. C. and the pressures change from atmospheric to 200 lb. per square inch. You would hesitate to operate a factory process with these variables and guarantee a product to satisfy the consumer. This is the first problem that confronts the chemical engineer in the treatment of water for locomotives.

These reactions are further influenced by the amounts and relative proportions of the various components in solution, as well as the physical character of matter in suspension.

The reaction temperatures of the water when treated range from slightly above 0 to 38 deg. C., while the outside temperatures go down to —37 deg. C. It is obviously impractical to heat the water to be treated in order to hasten the reaction and make the precipitated solids settle more rapidly, since all of the heat is again lost when the water is stored and the cost would not be justified. It is therefore necessary to precipitate the incrusting solids from the water without heating and at the lowest cost for chemicals, construction, operation and maintenance.

The first study for the chemical engineer before attempting the treatment of water supplies is the water conditions in relation to the operation of locomotives. The first concern of the operating official is to get trains over the road on time, and the next is to haul the largest tonnage possible. The movement of tonnage is the primary vocation of railroading. Therefore all work must be done with this end in view.

It is necessary to consider what waters are susceptible of treatment. The mere removal of the scale-forming salts is only part of the problem, and many waters are unsuitable for locomotives after the scale-forming ingredients have been removed. In such cases new waters must be developed wherever possible, and in some cases it is necessary to haul water from other stations at large expense, rather than attempt to use waters that may be available, because these waters may seriously interfere with the movement of trains. There may be cases where it would be economical to distill a portion of the supply in order to reduce the concentration of dissolved solids. While the writer has found some cases where this has been considered, he has never actually made such installation, having found some other solution for the problem in these cases.

Foaming a Great Handicap

The greatest difficulty encountered with water by the locomotive engineer is foaming, as this invariably results in slowing down and hence in delays. It is therefore necessary to produce a water that will show the least tendency to foam. Many water service engineers in the railway service advocate the over-treatment of boiler feed waters, because by so doing the reaction

Presented at the Denver meeting, American Institute of Chemical Engineers, July, 1924.

is more complete and the scale-forming solids may be reduced to the minimum. It is my experience that this method of treatment adds to the foaming difficulties of the engineer, and in certain localities, because of the mixing of treated and untreated waters, incrustation of the injectors and branch pipes gives trouble. It is therefore good policy to carry the water treatment as close to the end point as possible without carrying an excess either of caustic or carbonate alkalinity. Experience shows that this method has been successful and has resulted in a minimum of complaint from locomotive engineers from foaming. The amount of scale under this method of treatment is small, and it is of soft carbonate character and is readily washed out of the boiler.

Even with this treatment we are compelled to use some waters that have a tendency to foam, due largely to an excess of sodium salts, particularly sodium bicarbonate, which many of the natural waters carry. This condition must be taken care of by the use of an antifoaming compound, such as an emulsion of castor oil in water.

THE CORROSION PROBLEM DEFINED

Corrosion is an evil we have always with us, and while it gives the locomotive engineer little concern, it must be carefully considered in the economy of boiler maintenance. The causes for corrosion are fairly well agreed upon. The difficult thing in the treatment of locomotive boiler waters is the prevention of this evil. If we could eliminate the dissolved gases, particularly oxygen, and hold the hydrogen-ion concentration to a minimum, the corrosion problem would be practically solved. A satisfactory method for bringing about this condition in locomotive supplies has not yet been worked out.

It is evident from what has been said that it is necessary for the chemical engineer to study conditions on the inside of the boiler when engines are in the shop, and also to familiarize himself with the operation of the locomotive by riding with engineers so that he may know the requirements that must be met with the treated water. The analysis of waters taken from the boiler at different periods furnishes much information of value in the control of locomotive supply. It was formerly the practice to change engines at intervals of approximately 150 miles. It has been found that great economy can be effected by making the runs as long as possible, and without correct water conditions long engine runs cannot be made. It is now possible to run passenger engines 600 or 700 miles without change, and this is being done in normally bad water districts. Correct treatment of the water and careful control by the chemical engineering staff are prerequisite on the locomotive. A demonstration in which I took part was recently made to determine the possible performance of passenger engines. A mountain type engine was run west from the Missouri River 993 miles, pulling a full tonnage mail train, then made the return run with a similar train, a total of 1,986 miles continuous run without change of water in the boiler. Analysis of the boiler water upon arrival at destination showed satisfactory concentration, and the record of the engine showed practically perfect performance.

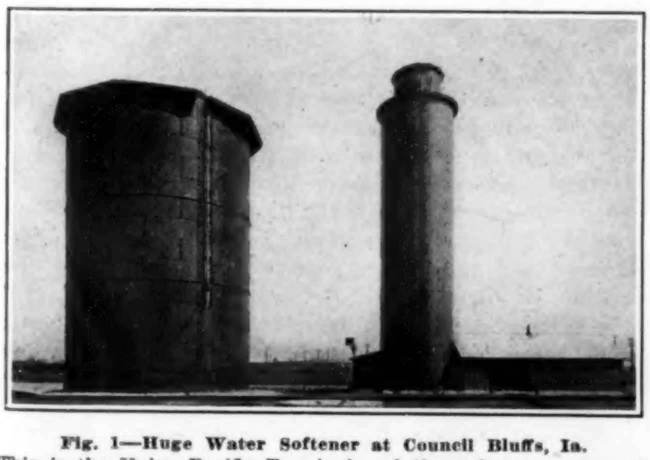


Fig. 1—Huge Water Softener at Council Bluffs, Ia.
This is the Union Pacific Terminal and the softener, a ground-operated type, has a capacity of 35,000 gal. per hour with 900,000 gal. storage

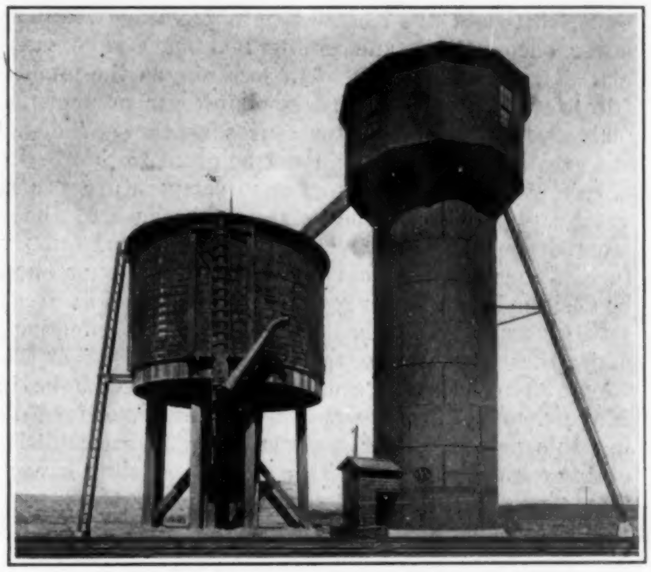


Fig. 2—Water Softener in Flat Desert Country
Here at Cooper Lake, Wyo., the softener is infrequently attended and the climate is cold in winter, hence it is a top fed, housed type, with single lift

SOME ENGINEERING PROBLEMS

In the construction of water softeners a number of chemical engineering problems arise. First, the satisfactory location of the softener in relation to other structures must be considered, in order to obtain the most economical operation of the softener. The treating plant must also be satisfactorily located with relation to the water supply to be treated. The water softener attendant usually has charge of the pumping plant, and being responsible for both plants, must have them so located that he can give both proper attention. In addition to this, the attendant in railway service may operate a coaling station, which demands convenient supervision. This is not always possible, but in many cases considerable saving can be effected by proper location.

In constructing the plant, the type of softener is of great importance. Wherever it is possible, it is economy to build the softener so that the treated water flows by gravity from the softener into the storage tank, thus saving double pumpage. In cases where other conditions make it necessary to pump the water to the softener and then pump again to the storage tank, the most economical construction is the rectangular concrete tank, such as is commonly built for the treatment of small municipal water supplies.

The next thing to be considered is climatic conditions.

Some softeners are located where freezing weather is never encountered, and piping and machinery can be placed in the most convenient location, as the temperature never interferes. In some of our northern climates where winter temperatures reach —37 deg. C. the greatest consideration must be given to this feature of water softener construction. Temperature has the greatest influence on the treatment because of the increased speed of the reaction with increased temperature. Therefore in cold climates the softener should be designed with larger reaction space as well as greater settling capacity. It has been found most effective to allow the chemicals to react for a period of at least 25 to 30 minutes before the settling process begins. If the chemical mixture and raw water are stirred during this period, better sedimentation is accomplished, giving a clearer water with a smaller settling capacity than if the chemicals and water were not stirred.

Many times the water softener also removes suspended solids, as in muddy waters. Sometimes a small amount of alum may be used, as is the practice in municipal filter plants. Many waters carrying high suspended solids can be clarified simply by lime-soda treatment if the character of the precipitate is such that it will carry down the suspended matter when settling.

Fig. 3—A Warmer Climate Where No Housing Is Necessary—Las Vegas, Nev.

The shape of the water softener tank is of some importance. While it is desirable to deliver direct from the softener to the storage tank, thus avoiding double pumping, this type of construction often gives the softener too small a diameter in relation to its height for correct reaction time, or requires the construction of a softener too large for the required service. In order to secure proper settling of the sludge, it is desirable that the rise of water in the softener should not exceed 10 ft. per hour, and in many cases a rate of 8 ft. per hour is more desirable. On the other hand, it has been shown that certain waters give a clear effluent through an excelsior filter with a rise as great as 15 ft. per hour. It is often desirable to make settling tests upon the water to be treated before designing the treating plant. In order to make the full capacity of the treating tank effective, it is necessary that the water passing out of the downtake spread over the entire area of the softener. If the downtake is too small in relation to the diameter of the softener, water passing out of the downtake will create upward currents without spreading to the outside of the tank. This reduces the capacity of the softener.

In the construction of steel equipment for water softening the chemical engineer must give consideration to the life of the different parts of this steel construction as well as to strength of riveted joints, weight of load on foundation, wind pressures and other more strictly engineering features. Treating plants that have now been in operation for 21 years or more indicate that for most waters there is very little corrosion of the steel inside the softener below the water line. In many cases there is considerable corrosion of the top sheet at the water line. It is therefore good practice to increase slightly the thickness of the top sheet to allow for such corrosion. It is also our practice to make the bottom of the softener of extra heavy plate, as it is difficult to prevent some corrosion on the under side of this sheet and difficult to replace this part of the machine. On account of corrosion of parts above the surface of the water, it is desirable to make I-beams and other structural steel in such places of greater weight than mere strength requirements would call for.

If it were possible to treat waters in exact accordance with the equations already shown, the problem would be a very simple one. Theoretically it should be possible to remove the incrusting solids to the point of solubility of calcium carbonate in cold water, as this is the form in which most of the material is precipitated. According to Olsen (Van Nostrand's Chemical Annual) calcium carbonate is soluble in cold water to the extent of thirteen parts per million, and magnesium hydrate, in which form the magnesium salts are precipitated, is soluble to the extent of nine parts per million.

In waters having a moderate temperature—that is, 15 to 25 deg. C.—with a 30-minute reaction time and 5 hours settling, some waters can be treated as low as fifty-five parts per million. In our experience they rarely go below this. While it is frequently asserted that, all conditions being equal, the hardness of water can be reduced further by carrying an excess of both caustic and carbonate alkalinity, we frequently find that certain waters can be treated to fifty-five parts of hardness per million without carrying any excess of the precipitant. On the other hand, we frequently find waters which even an over-treatment will not bring nearly as low as this. A certain water under exactly the same conditions of temperature, reaction time and settling space as the one shown above gave a hardness of ninety parts per million and carried an excess of both caustic and carbonate alkalinity.

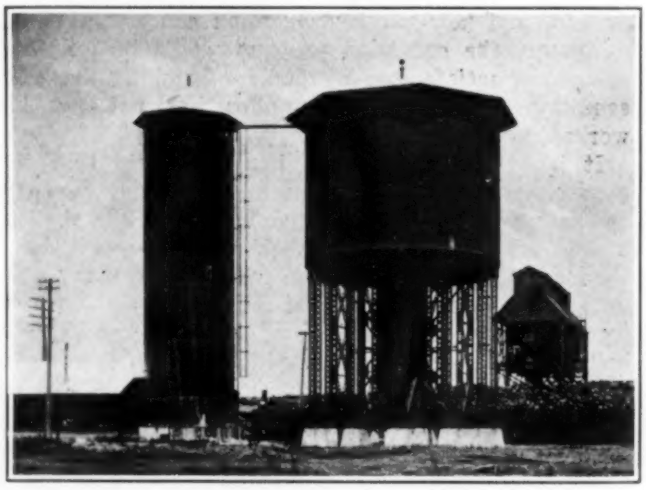


Fig. 4—Another Large Softener
18,000 gal. per hour, ground-operated at coaling station, Junction City, Kan.

Since the range of conditions is so variable and it is therefore necessary in many cases to have a considerable quantity of the scale-forming salts remaining in

solution, it has been our practice to avoid the addition of excessive amounts of lime and soda ash at all treating plants. This avoids the incrusting of injectors and branch pipes, holds the foaming tendency to a minimum and at the same time gives a water which operates satisfactorily in locomotives. From such treatment the maximum efficiency of the fuel is also obtained, as fuel losses due to excessive use of the blow-off on account of foaming are prevented and heat transfer is made efficient by keeping the tubes clean.

The question is frequently asked, "Why do you not use zeolite water softeners on railroads?" A zeolite softener removes the scale-forming salts by exchanging the sodium content of the zeolite for calcium and magnesium content of the water. This results in what the manufacturer refers to as zero hardness because of the complete removal of the calcium and magnesium from the water. However, there must be in the treated water a molecular equivalent of both sodium bicarbonate and sodium sulphate replacing the calcium and magnesium bicarbonates and calcium and magnesium sulphates in the original water. As nearly all of the naturally hard waters carry a considerable amount of carbonate hardness, it is evident that the treated water will carry a similar amount of sodium bicarbonate. This would invariably aggravate foaming, not only making operation expensive, but resulting in great dissatisfaction among the men who handle the engines.

Sodium aluminate has recently been put on the market for use in water softening. This material has always been considered prohibitive on account of cost. This cost is still high as compared with the use of lime and soda ash. There are, however, some cases where this material can be used to advantage. It reacts quickly in the cold, forming a flocculent precipitate which in cases of muddy waters takes the place of alum and at the same time acts as a softening agent. Our experiments showed that the use of sodium aluminate combined with lime and soda ash gave a hardness of 70 parts per million as against 90 parts per million, which was the best we were able to obtain with straight lime-soda treatment. These experiments were carried out on a very hard cold water at an increased cost of 10 per cent over the straight lime-soda treatment.

A considerable amount of careful and painstaking laboratory work has been done on boiler feed waters which does not permit of practical application, particularly to locomotive boilers. It is obviously impossible to maintain chemical control on the locomotive. Therefore the chemical engineer must maintain his control largely at terminals. Because of the conditions peculiar to railroad service, the problem of water supply and treatment is much more complicated than in the case of stationary power plants, using a single supply with a laboratory close at hand.

If this paper has been able to bring to your attention some of the many problems of water supply on a railroad and to emphasize the necessity of solving them with the aid of a chemical engineer rather than a laboratory chemist, it will have fulfilled its purpose.

Graphite Production in 1923

The graphite-mining industry in the United States made considerable progress in 1923 according to a report prepared in the Department of the Interior by the United States Geological Survey, in co-operation with the geological surveys of Alabama, Michigan and New York. During the World War this industry flourished, for graphite is an essential war mineral, and large stocks of it, both domestic and foreign, were accumulated. Consequently in the years immediately after the war the industry languished. In 1923, however, there was an increase in the quantity sold and imported, as well as in value, the sales amounting to 4,056 tons of amorphous graphite and 3,964,900 lb. of crystalline graphite, compared with 2,200 tons of amorphous graphite and 1,849,766 lb. of crystalline graphite in 1922. The manufacture of artificial graphite at Niagara Falls, N. Y., reached the high mark of 26,761,015 lb., more than twice the output there in 1922. The quantity of graphite imported for consumption rose from 12,488 short tons in 1922 to 19,434 tons in 1923, an increase of 56 per cent.

Cement Manufacturers Use More Oil

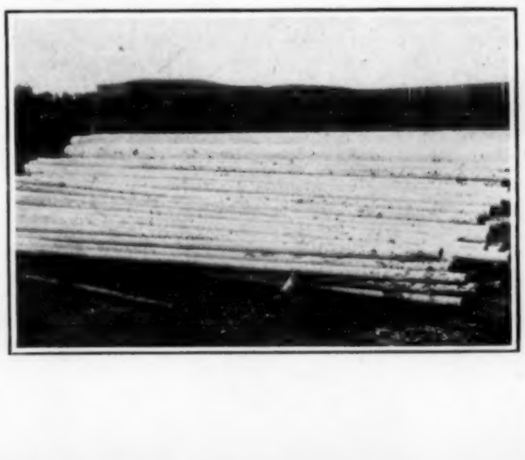
Recently attention has been focused on the use of fuel oil in the manufacture of portland cement because of the uncertainties of coal production. At least four of the plants that are now listed as under construction will be equipped with oil-burning kilns. In addition to the recent conversion of one of the Western plants from coal to oil, this would indicate that the oil will be used to an increasing extent as a fuel in cement manufacturing.

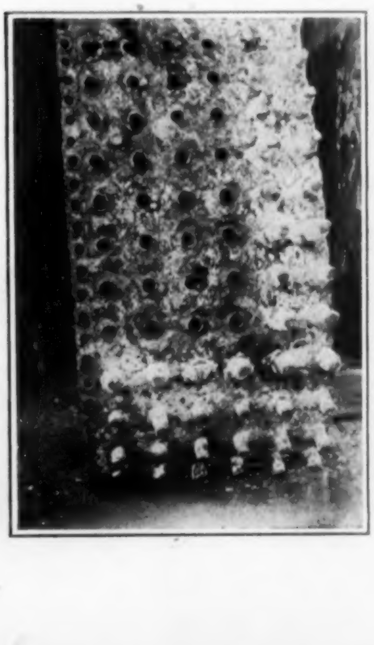
Fig. 5

At left—Sections of boiler tubes after scale has been removed, showing pitting and corrosion that takes place.

Below—Locomotive tubes with heavy scale. This shows how the rate of heat transfer is cut down and efficiency lost on account of scale formation.

At right—Boiler plate, showing scale formation.





Equipment News

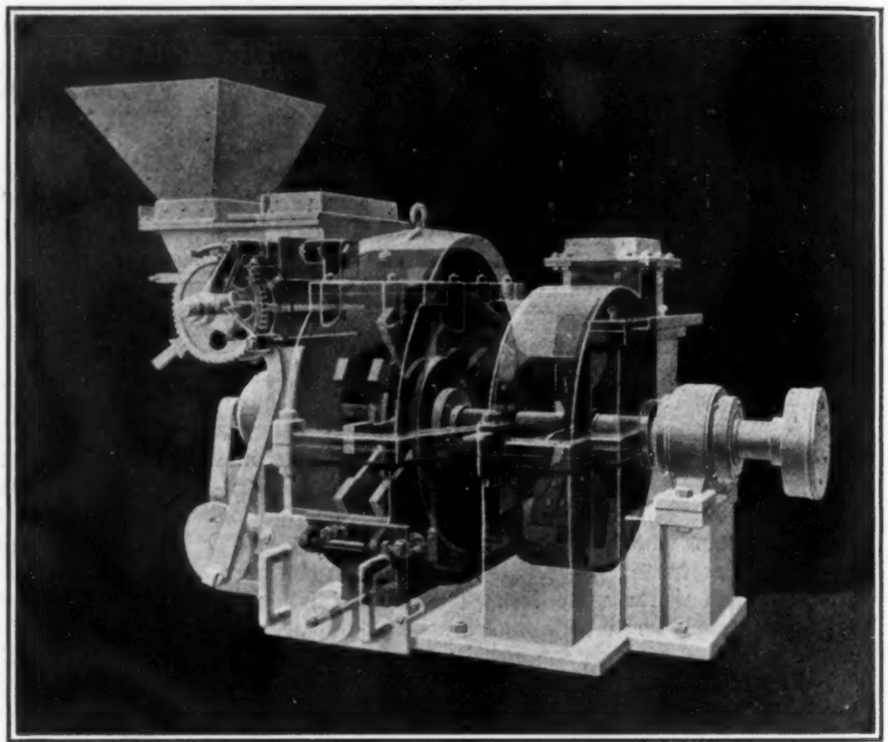
From Maker and User

Unit Impact Pulverizer

Along with the development of the powdered coal method for firing boilers has grown a demand for a small unit that could be applied to single boilers and that would effect the preparation of the fuel as economically as could be done in a central grinding plant of a large power station. Several such units have been used, and have given good results when a uniform quality of coal carrying but little moisture was supplied. However, when such conditions did not hold, these units have not given results comparing favorably with those of a central grinding station.

In an endeavor to supply the need for such equipment, the Raymond Bros. Impact Pulverizer Co., Chicago, Ill., has devoted much study to the problem. As a result of this study, this concern has recently placed on the market a unit pulverizer called the "Imp" which is claimed to fit the needs of the case, having the following five definite advantages:

1. It pulverizes the coal to the necessary fineness with a sufficiently low power consumption to approximate the results given by a central grinding plant.
2. It operates on a low cost for maintenance and repairs.
3. It is capable of constant adjstment to insure a uniform fineness of product without sacrifice of capacity.
4. It produces uniform results, even though the coal used varies widely in character and moisture content.
5. It is capable of installation for a small investment per unit.



Phantom View of Unit Pulverizer

This pulverizer is of the well-known swing-hammer type of impact pulverizer. The accompanying phantom view of the unit, including feeder, pulverizer and conveying fan, shows the construction clearly. Adjustment for fineness of product is accomplished by means of a regulator attachment bolted on the main shaft between the rotor and the fan. The fan is an integral part of the machine and is designed to give the minimum quantity of air necessary for separation, and to carry the powdered coal to the furnace in a non-explosive mixture.

The unit can be used satisfactorily with many other materials than coal, such as chemicals, clays, pigments, etc. If so used the Raymond standard return air system with Cyclone collector is used, the can carrying the ground material to the collector.

The sizes, capacities and space and power requirements of the Imp pulverizer are given in the accompanying table.

Size	Approximate Weight	Floor Space	Capacity—Pounds per Hour—95 per Cent 100 Mesh	Capacity—Pounds per Hour—85 per Cent 100 Mesh	Size Motor
No. 2 Imp	2,500 lb.	2 ft. 6 in. x 3 ft. 6 in.	500	800	10 hp.
No. 3 Imp	3,500 lb.	3 ft. 0 in. x 4 ft. 6 in.	1,250	2,000	25 hp.
No. 5 Imp	7,500 lb.	4 ft. 0 in. x 5 ft. 6 in.	3,000	4,500	50 hp.
No. 7 Imp	12,000 lb.	4 ft. 6 in. x 7 ft. 0 in.	4,000	6,000	60 hp.

NOTE—Capacities are based on ordinary grades of bituminous coal, crushed to pass a 1 in. ring and carrying not over 5 per cent surface moisture.

A Propeller Blower

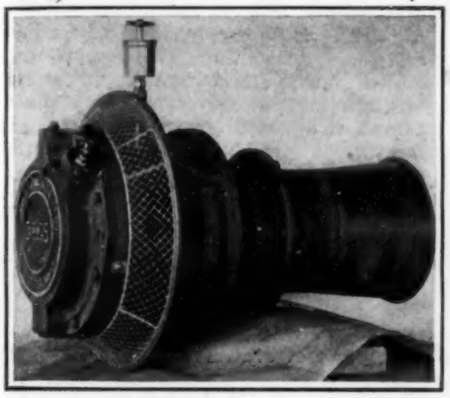
A propeller blower recently perfected will be of interest to chemical manufacturing plants where air heating and drying installations are required and where an efficient ventilating system is necessary. In using a propeller type blower the air leaves in the same direction as it enters and this particular blower has features not possessed by other blowers of the same type. Operating against pressures up to 8 in. water, it can be utilized where, until now, only centrifugal blowers could be used. It is claimed that its efficiency runs up to 80 per cent and at a constant speed the power consumption is practically unaffected by variations in air delivery or pressure.

The stationary guide vane beyond the propeller is the principal feature of the blower. The air current leaving the propeller is radially subdivided by the individual guide vane blades and taken up by them without shock. The curvature of the guide vane blades increases in the direction of rotation of the propeller and serves to concentrate the air current and give it a further acceleration inside the stationary guide vane so that a considerable part of the pressure is produced in the latter.

The fan casing of the blower has a conically shaped outer shell connected by integral ribs to an inner conical part forming the turbine casing or motor support, according to the power used. The bearing bushing, in which are mounted two double row ball bearings for carrying the shaft, is mounted in a central and accurately reamed hole. The air enters between the outer shell and inner cone, drawn in by the propeller, not only parallel to the axis, as is the case with all propeller blowers, but also radially at the periphery.

The bearing sleeve, two ball bearings, the shaft, two end inclosures, one on each side, two shaft bushings, steam packing box, three keys and two shaft end nuts make up the motor. The turbine wheel is of solid bronze and the buckets or blades are cast into the wheel. Double-stage turbine wheels are used.

The fan is cast in one piece with five blades arranged in a spiral form on a central hub and having a supporting



Propeller Air Blower

ring at the periphery. The guide vane casing is made up of a cast-iron shell and hub with eight spiral sheet-iron blades, the ends of which are cast into the casing and hub respectively. The entrance section of the guide vane casing is of the same diameter as the fan and it first increases slightly and then decreases gradually toward the outlet to a diameter smaller than the fan. A diffuser is attached to the flange at the outlet of the guide vane casing. As this blower has a much larger air delivery than other fans of the same diameter, it is found that the high dynamic pressure must be transformed through the diffuser into static pressure. A close mesh wire screen at the inlet of the blower prevents accidents as well as the entrance of foreign matter.

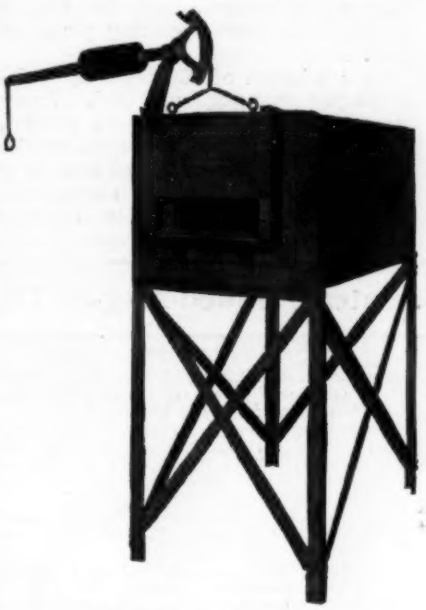
Because of the blower's high efficiency it is possible to operate it at a lower power consumption. In case of electric drive it is found that much smaller sized motors may be used. As a result of the compactness of design the blowers can be readily installed in pipe lines and this is of distinct advantage in ventilating, heating and drying systems. When installed at the entrance or at the end of the air duct and operating as blowers or exhauster it is found that they work with the same efficiency. The device is manufactured by the Coppus Engineering & Equipment Co., Worcester, Mass.

Industrial Electric Furnace

A new industrial hearth-type electric furnace for operation up to 1850 deg. F. has been recently perfected by the Westinghouse Electric & Manufacturing Co. These furnaces, which are known as type B, are made with hearth sizes ranging from 4 inches wide and 10¼ inches deep to 12 inches wide and 36 inches deep and are particularly well suited for such operations as annealing, hardening, tempering, normalizing, carbonizing, casehardening, vitreous enameling, and for laboratory work. Automatic temperature control makes it possible to duplicate heating conditions as often as is necessary and enables a predetermined manufacturing schedule to be carried out.

One of the distinctive features of this new furnace is that the muffle plates, which completely inclose the heating chamber, are perforated so that heat is radiated directly from the heating element to the charge. This unusual construction permits a higher temperature in the heating chamber without undue deterioration of the heating elements. These elements, which consist of S-bend coils of nickel-chromium wire, are placed on all four sides of the heating chamber and are supported and aligned by molded studs on the muffle plates.

The door of the type B furnace is suspended by a chain from one point, which, being always on the circumference of an arc at the end of the operating handle, maintains a position directly over the center of the door when it is being opened or closed. This method of operation prevents the door from sticking or jamming in its guides. Pieces of angle iron bolted to the guides are so adjusted that the door is held closely against the front casting



Industrial Electric Furnace

when closed but can move easily when being opened.

A superior point in the design of this new furnace is the arrangement of the insulation so that the muffle plates do not carry any of the weight. Standard insulating bricks next to the shell are supported by the high-temperature insulation, which is in the form of slabs. In this way the muffles are relieved of the weight of the insulation, a desirable feature in this type of furnace.

The furnace shell, or casing, is of heavy sheet steel, with the sides and bottom in one piece. The top, however, is a separate piece, to facilitate removal for the purpose of making repairs to the insulation or heating element.

The rear casting design is a frame supporting an asbestos panel through which the ends of the heating coil protrude. Heavy air-cooled connectors join the coils in series and connect to the lines.

One of the many advantages claimed is the automatic control, enabling the operator to maintain a desired temperature indefinitely. The automatic electric control consists of a control pyrometer, a relay and magnetic contactor. In the control instrument, a stationary pointer carrying two electric contacts is set at the desired temperature and the furnace turned on by a conveniently located push button. As the temperature rises, an indicating hand in the control instrument, actuated by a thermocouple in the furnace chamber, moves along the scale. When it reaches the upper of the two contacts carried by the stationary pointer, the relay is energized, opening the magnetic contactors and cutting off the current. When the temperature falls to the point where the indicating hand reaches the lower of the contacts on the stationary pointer, the relay cuts the current on again. This cycle, continuing as long as the furnace is in operation, maintains the temperature within approximately 1 per cent of the desired point without any attention on the part of the operator.

Manufacturers' Latest Publications

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Bulletin 1448-B. A new issue of the catalog on the "Gates" rock and ore breaker, made by this company.

Automatic & Electric Furnaces, Ltd., 173 Farringdon Road, London, E. C. 1.—A folder on electric furnaces with internal heaters, suitable for temperatures up to 1000 deg. C. and with or without automatic control.

De Laval Steam Turbine Co., Trenton, N. J.—Bulletin E-1059. A description of the installation of De Laval single stage fire pumps at Lowell, Mass. Also Bulletin E-1060, a catalog covering the above design of equipment.

The Brown Hoisting Machinery Co., Cleveland, O.—Catalog M-24. A new complete catalog of belt conveyors containing specifications of standardized belt conveyors and many engineering data of interest to those having belt conveyor problems.

The Bristol Co., Waterbury, Conn.—Bulletin 298. A folder on indicating and recording pyrometers of stationary and portable types.

Leeds & Northrup Co., Philadelphia, Pa. —Bulletin 871. The first of a series of bulletins on the use of electrical measuring instruments in the power plant, this number covering temperature measurements in generators, transformers and cable systems.

Bethlehem Foundry & Machine Co., Bethlehem, Pa.—Bulletin 500. A catalog on heat transfer apparatus of the patented "Original Frederking" design, in which the circulating tubes are cast integrally with the shell.

General Electric Co., Schenectady, N. Y. —Catalog Y-863-B. An interesting pictorial showing interior and exterior views of various plants of this company, designed to acquaint the public with the equipment and operation of this company.

Steere Engineering Co., Detroit, Mich.—Pamphlet 263. A leaflet on the 4-foot steel blast gate.

Esterline-Angus Co., Indianapolis, Ind.—Bulletin 624. A bulletin on the use of graphic instruments in the power plant.

Harbison-Walker Refractories Co., Pittsburgh, Pa.—A well-illustrated and interesting catalog on "Thermolith," the high-temperature cement made by this company. This book describes the method of using Thermolith in various industries and gives scientific data relative to its performance.

Schaffer Poidometer Co., Pittsburgh, Pa. —A new catalog describing apparatus for the automatic weighing, feeding and conveying of solids and liquids.

Columbia Tool Steel Co., Chicago Heights, Ill. — The Columbia Tool Steel Handbook, a new issue of a useful treatise on the use and handling of tool steels, together with much new information and many data.

Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill.—Book 580. A new catalog of Link-Belt electric hoists and overhead cranes, containing specifications of various types and useful information on applications.

Review of Recent Patents

Aromatic Sulphonic Acids

A process particularly applicable for the sulphonation of aromatic hydrocarbons contained in waste gases of other processes, such as catalytic oxidation, has been developed by Frank A. Canon, of Crafton, Pa. One method of applying it may be illustrated by the use of waste converter gases containing benzol and inert gases.

Sulphuric acid of specific gravity 1.84 maintained at a temperature of 180 deg. C. is caused to descend from plate to plate in a cap and bell column. A stream of inert gas containing about 30 parts of inert gas to 1 part C_6H_6 by weight is caused to pass up the tower, where it comes into contact with the hot sulphuric acid with the formation of water and benzene sulphonic acids. The hot inert gases absorb the water of reaction and carry it as a vapor through an outlet near the top of the column into the atmosphere. The sulphonic acids, which will be found to be approximately 25 per cent of benzene monosulphonic acid and 75 per cent benzene disulphonic acid with a slight excess of sulphuric acid, are carried down by gravity to the base of the column, where they are discharged through a trap into a suitable receptacle. With enough time of contact, substantially no benzene as such escapes at the top of the column. (1,503,937, assigned to The Barrett Co., Aug. 5, 1924.)

Separating Meta-Cresol and Para-Cresol

Meta-cresol and para-cresol may be separated, according to Jacob Ehrlich, of Belleville, N. J., by forming nitroso-meta-cresol under conditions that do not yield the corresponding para compound.

To a mixture of 330 parts by weight of 60 per cent sulphuric acid, 27 parts by weight of toluol and 28 parts by weight of a mixture of cresols containing 57 per cent meta-cresol and 43 per cent para-cresol is added a concentrated solution of sodium nitrite (approximately a 36 per cent solution) containing 12.5 parts by weight of sodium nitrite. The sodium nitrite solution is added slowly and with constant vigorous stirring, the mixture being maintained at approximately 0 deg. C. The mixture is stirred for about 5 minutes after the sodium nitrite has been introduced and is then filtered. The precipitate is washed with water to remove the sulphuric acid and then with toluol to remove the original toluol solution with its dissolved compounds. The remaining nitroso-meta-cresol is then dried and appears as a light yellow micro-crystalline powder. (1,502,849, assigned to Verona Chemical Co., North Newark, N. J., July 29, 1924.)

Aluminum Chloride

Frank W. Hall, of Port Arthur, Tex., proposes to make the production of aluminum chloride a continuous operation by utilizing the spent residue to form a seal in the discharge mechanism. A mixture of bauxite and acid sludge is coked to give a porous, substantially uniform product that is especially susceptible to chlorination. This coked mixture is charged into the top of a vertical retort and heated to the required temperature. Chlorine is then admitted, the aluminum chloride formed

U. S. Patents Issued August 19, 1924

Device for Developing Gas Under Pressure from Liquefied Gases. Paul Heylandt, Berlin-Sudende, Germany.—1,505,095.

Electrochemical Process of Treating Liquids. Frank N. Moerk, Philadelphia, Pa.—1,505,104.

Process for Electrodepositing Lead Upon Iron. Bertrand S. Summers, Port Huron, Mich.—1,505,109.

Applying Protective Coatings. Josef von Vass, Budapest, Hungary.—1,505,112.

Expansion Joint. Hamilton Allport, Reading, Mass.—1,505,121.

Roller Grinding Mill. Lucius F. Little and Mark J. Mayhew, Owensboro, Ky.—1,505,154.

Method of Grinding. Stefan Steinmetz, Berlin, Germany.—1,505,170.

Permanent Colorimetric Standard for Hydrogen-Ion Determination. Marion S. Badollet, John Hamilton and Charles F. Walton, Jr., Washington, D. C., dedicated, by mesne assignments, to the Citizens of the U. S. of America.—1,505,185.

Recovery of Magnesium Compounds From Brines. Edward K. Judd, Palisade, N. J., assignor of one-third to Alfred M. Thomsen, Alameda, Calif., and one-third to Emerson W. Judd, New York, N. Y.—1,505,202.

Plastic Composition and Method of Preparing Same. Hugh Knight, Riverside, Calif.—1,505,206.

Recuperator for Furnaces. Adam Felton and Edward H. Klemroth, Muncie, Ind.—1,505,249.

Process for the Manufacture of Steel and the Fixation of Nitrogen. Adriaan Nagelvoort, Providence, R. I., assignor to Nitrogen Corp., Providence, R. I.—1,505,281.

Method of Recovery of Potassium and Magnesium Salts From Natural Brines and Calcareous Muds. Joseph L. Silsbee, Salt Lake City, Utah.—1,505,295.

Gaseous Fuel. John Harris, Lakewood, O., assignor to Carbo-Oxygen Co., Cleveland, O.—1,505,339-1,505,340.

Method of Determining the Volume of Occluded Gas in a Plastic Mass. Wilfrid P. Heath, Chicago, Ill., assignor to Mojonnier Bros. Co., Chicago, Ill.—1,505,342.

Process of Manufacturing Formolophenolic Varnishes and the Like. Joseph Filhol, Lyon, France.—1,505,382.

Process of Extracting Turpentine and Rosin From Resinous Wood. Clarence M. Sherwood and Raymond K. Cole, Brunswick, Ga., assignors to Hercules Powder Co., Wilmington, Del.—1,505,438.

Process of Manufacturing Active Carbon. Karl Rhode, Berlin-Charlottenburg, Germany, assignor to Chemische Fabrik auf Actien (vorm. E. Schering), Berlin, Germany.—1,505,496.

Process of Activating Carbon. John C. Woodruff and Thorne L. Wheeler, New York, N. Y.—1,505,517.

Machine for Forming Glass Articles. Henry M. Brookfield, New York, N. Y., assignor to Brookfield Glass Co.—1,505,537.

Azo Dyes Insoluble in Water and Process of Making Same. August Leopold Laska and Arthur Zitscher, Offenbach-on-the-Main, Germany, assignors to the Corp. of Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany.—1,505,568.

Azo Dyes Derived From Acylacetyl Compounds of Diamins and Process of Making Same. August L. Laska and Arthur Zitscher, Offenbach-on-the-Main, Germany, assignors to the Corp. Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany.—1,505,569.

Distilling Apparatus. John Preston Foster, Paia, Maui, Hawaii.—1,505,634.

Production of Calcium Arsenate Free From Water-Soluble Arsenic. James G. Lamb, Denver, Colo., assignor to American Smelting & Refining Co., New York, N. Y.—1,505,648.

Apparatus for the Production of Ozone. John R. Quain, London, England.—1,505,669.

Manufacture of Dextrine. Richard G. Brindle, Chicago, Ill., assignor to Corn Products Refining Co.—1,505,696.

These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent Office because they appear to have pertinent interest for "Chem. & Met." readers. They will be studied later by "Chem. & Met.'s" staff, and those which, in our judgment, are most worthy, will be published in abstract.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Production of Arsenates From Speiss. Clarence P. Linville, Elizabeth, N. J., assignor to American Smelting & Refining Co., New York, N. Y.—1,505,718.

Table Concentrator. Albert T. Stebbins, Los Angeles, Calif.—1,505,734-1,505,738.

Apparatus for Grinding Wood Pulp. John J. Warren, Brownville, N. Y.—1,505,757.

Apparatus for and Method of Decantation. Louis Wilputte, New Rochelle, N. Y., assignor of two-thirds to Alice A. Wilputte, New Rochelle, N. Y.—1,505,759.

Tunnel Kiln and Method of Operating Same. Philip d'H. Dressler, Zanesville, O., assignor to American Dressler Tunnel Kilns, Inc., New York, N. Y.—1,505,767-8.

Dyeing Apparatus. Lucien P. Hart, Philadelphia, Pa.—1,505,781.

Carboy Bonnet. Charles Lefkowitz, Newark, N. J.—1,505,790.

Apparatus for Separating Liquids of Different Specific Gravities and Indicating Means Therefor. Charles S. Lenz and George E. Jupp, New York, N. Y., assignors, by mesne assignments to American Marine Devices Corp., New York, N. Y.—1,505,791.

Apparatus for Condensing and Fractionating Hydrocarbons. Ernest Owen, New York, N. Y.—1,505,798.

Rotary Screen. Joseph A. White, Philadelphia, Pa., assignor to Moore & White Co., Philadelphia, Pa.—1,505,835.

Method of and Means for Separating Liquids of Different Specific Gravity. Harold M. Alexander, Bexley Heath, England.—1,505,841.

Drying Machine. Peter Breuer, Milwaukee, Wis.—1,505,855.

Process of Treating Hydrocarbon Oils. Harry H. Culmer, Chicago, Ill.—1,505,870.

Refrigerating System. William E. Hexamer, Philadelphia, Pa.—1,505,891.

Filter. Barry Kirby, Los Altos, Calif.—1,505,898.

Cement Furnace. Andrew G. Croll, Allentown, Pa., assignor to Atlas Portland Cement Co.—1,505,918.

Device for the Continuous Treatment of Ligneous Materials for Their Transformation in Cellulose. André Olier, Clermont-Ferrand, France, assignor to Société Anonyme des Etablissements A. Olier, Clermont-Ferrand (Puy-de-Dome), France.—1,505,934.

passing as vapor to the condensers, where it solidifies in anhydrous form. As the coked mixture contains an excess of aluminum ore, there remains in the retort fine white ash in quantity sufficient to form a seal in the bottom of the retort and thus permit the use of a continuous rotating discharge mechanism. (1,503,648, assigned to the Texas Co., New York, Aug. 5, 1924.)

Kieselguhr Filter-Aid

For use as a filtration accelerator in sugar or oil refining, kieselguhr may be first treated according to a process developed by Charles F. Ritchie, of Lompoc, Calif. He has used as raw material a product resulting from the calcination of kieselguhr mixed with 5 per cent salt at 1,800 deg. F. for 1 hour in a muffle furnace. The original kieselguhr contained 7 per cent moisture and was so milled that 95 per cent passed 200 mesh. The product of this first calcination was milled through a Williams swing-hammer mill and heated again to 1,800 deg. F.

Tests of the products were made as follows: 60 lb. raw cane sugar was dissolved in 40 lb. water at 80 deg. C. and 0.48 lb. kieselguhr added. On pumping through a filter press with a filter area of 0.37 sq.ft., the following amounts of filtrate were obtained in 12 minutes: With original kieselguhr, 6.4 lb.; with once-calcined kieselguhr, 35.0 lb.; with twice-calcined kieselguhr, 51.5 lb. (1,503,133, assigned to the Celite Co., of Los Angeles, Calif., July 29, 1924.)

Readers' Views and Comments

An Open Forum

The editors invite discussion of articles and editorials or other topics of interest

Cost of Exhaust Steam

To the Editor of Chem. & Met.:

Sir—In the article on "How Shall We Calculate the Cost of Exhaust Steam?" (July 28, 1924, p. 150), Mr. Fuwa has evidently based his calculations on the assumption, which he seems to consider a fact, that the prime mover—that is, the steam engine or steam turbine—is not using any of the latent heat in the steam. This is a very serious mistake, of course, because even a very poorly designed prime mover will use an appreciable part of the latent heat and transform it into mechanical work.

Using his own figures, and starting with dry steam of 160 lb. gage (must have meant absolute) pressure, and expanding it to 26 in. of vacuum, he will require theoretically, under ideal conditions, approximately 30 lb. of steam per hp.-hr. A good prime mover will actually develop 1 hp.-hr. under the above pressure limits, on 14 lb. of steam. The difference is furnished by that portion of the steam that condenses during expansion and changes its latent heat into mechanical work. An average prime mover will change between those pressure limits approximately 20 per cent of the total latent heat into mechanical work. Thus the steam exhausted from the engine will contain 20 per cent moisture, and its "condition" will be 80 per cent.

You can readily understand that exhaust steam containing an appreciable proportion of moisture is not the equivalent of live steam, which is nearly, or entirely, dry, and may be even superheated.

I have made a very careful survey of the Great Western and Atlas plants of the U. S. Food Products Corporation, and found that under the most favorable conditions the exhaust steam sent to the evaporators and stills was only 80 per cent steam and 20 per cent moisture. This circumstance was not due to excessive radiation losses, but largely to the conversion of latent heat into mechanical work in the prime movers.

Careful analysis shows that we are not making a serious mistake if we adopt the policy of not permitting any medium pressure exhaust steam (6 to 10 lb. gage) to escape into the atmosphere, but rather use less exhaust steam and make up the difference between supply and demand by live steam. The work performed by this steam is much more important at low pressures than at higher pressures, and the waste of medium pressure exhaust steam is wholly inadmissible from an economic standpoint. For this reason, also, we have never used exhaust steam for occasional or incidental loads, but kept the demand of exhaust steam absolutely steady. This is true even for the bleeding type steam turbines, where incidental loads are very objectionable.

It is common to see plants where the prime mover discharges into a header with a back pressure of, say, 10 lb. gage, and much exhaust steam is only partly used for manufacturing purposes, the remainder escaping through a relief valve. We are assured in such cases that it is only exhaust steam, but if a heat balance were struck, it will be found that such method of operation is very wasteful.

There is no good reason why the evaporator or still should not be charged for every B.t.u. it receives from the prime mover. Mechanical engineers refuse to assume responsibility for the heat rejected from the engine, and base their calculations not on the heat units furnished but on the efficiency with which their mechanical device carries out a predetermined cycle, such as, for example, the Rankine cycle. It would be far better for the chemists, too, to follow this example, and instead of comparing heat units furnished with the change in free energy, to use a far more practical method of calculation, by assuming a cycle such as the mechanical engineers are always assuming for their thermal processes, and to base the efficiency calculations on these cycles. This will not credit the system with the heat rejected, but will give a far better insight into the efficiency of mechanical appliances and enables one to perform calculations as to radiation losses, etc.

It is true that an evaporator or still condenses all the steam used in the process, but in turn evaporates a corresponding volume of moisture or solvent. Eventually such vapors are condensed in an atmospheric or surface condenser, or dephlegmator and condenser, in case the apparatus is a still, and the heat thus rejected should not enter into the calculations. The difference between the heat furnished to the prime mover and the heat rejected by the evaporator is the total number of B.t.u. used by the prime mover and chemical equipment combined. Each one should be charged, therefore, with the B.t.u. it is using and neither should be charged with the heat which is finally rejected.

In this case, the cost of condensation is chargeable to the chemical equipment.

E. J. WINTER,
Consulting Engineer.

New York City.

To the Editor of Chem. & Met.:

Sir—I wish to call your attention to the following statement made by Mr. Winter: "There is no good reason why the evaporator or still should not be charged for every B.t.u. it receives from the prime mover."

As a matter of fact there is a very good reason why it is unsound to charge the cost of steam to an evaporator on a B.t.u. basis. The value of the steam exhausted from the prime mover depends upon its temperature potential above final condensation, or in other words, its ability to do work. For example, a single-effect evaporator can be operated satisfactorily when the temperature difference between the condensing steam and the boiling liquor is 20 deg. F. Under like conditions and in the case of a double-effect evaporator, a terminal temperature difference of 40 deg. F. will be necessary, and so on. It follows, therefore, that at the temperature of final condensation a quantity of steam containing 1,000,000 B.t.u. would be worthless, but at a temperature of 20 deg. F. above this point the same million B.t.u. would have a definite value, say x cents, for use in a single-effect evaporator. However, if the installation were double-effect, this steam would have to be at a temperature level of 40 deg. F. above final condensation in order to have any value. This progressive increase in the value of exhaust steam is illustrated by the following table:

Temp., Deg. F.	Temp. Diff., Deg. F.	Vacuum in. Hg, 30 in. Bar.	Abs. Press., Lb.	Relative Value of Steam per Million B.t.u.
126	0	26.0	2.0	Nothing
146	20	23.1	3.4	x cents
166	40	18.8	5.5	$2x$ cents
186	60	12.5	8.6	$3x$ cents
206	80	3.5	13.0	$4x$ cents
226	100	....	19.3	$5x$ cents

TYLER FUWA.

Cambridge, Mass.

Book Reviews

GENERAL CHEMISTRY; An elementary survey emphasizing industrial applications of fundamental principles. 605 pages. By *Horace G. Deming*. John Wiley & Sons, Inc., New York. Price $3.50.

Efforts to produce a more valuable text for the presentation of the basic principles of chemistry have been numerous for some time past, fruitful in the number if not in the quality of all of the works produced. The underlying structure of most of these has been the same, the general order of presentation quite fixed. For these reasons Professor Deming's attempt to present a modern treatise based on a new method of presentation is significant—significant in that he succeeds in large measure in accomplishing his avowed purpose.

From start to finish it is evident that the author keeps reader interest in mind nor does he assume unusual intelligence or previous training in the science. The result is a book of interest to studiously inclined laymen as well as to the college student who may or may not be planning to major in the subject. The teacher of chemistry will find the book novel in its flexibility—it is so arranged and cross-referenced that any reasonable order of presentation may be adopted and followed, depending upon the specific requirements of a given group of students. Each section is largely independent, each subject developed very nearly as a unit topic. Applications of fundamental principles are invariably tied together by the reference system noted above. Following each section, of which there are forty-seven, exercises are provided that serve to assist the student in crystallizing his notions on the various topics treated.

In general subject matter this book is by no means unique. The usual ground is covered, from "What Is Chemistry About?" to "Methods for Preparing Colloids." Theoretical discussions mingle with purely descriptive matter to some extent, but useless description is conspicuous by its absence. For instance, one may search in vain for information concerning hypobromous acid or phosphoryl chloride. Such a material as kaolin, however, is the subject of a dissertation on the refractory industries. Here, as in other cases where Professor Deming includes discussions of the industrial applications of the various branches of chemistry, his account is hardly more than skin deep, but his statements are accurate and well chosen. In a text of this length it is difficult to do more.

The book is thoroughly up to date in its point of view. In the development of underlying principles stress is constantly laid upon the nature of matter as it is understood at present. The wide significance of the electron theory and of ionization is emphasized, colloidal phenomona are recognized to be of great importance and so deserving of more space than has been accorded this branch in many of the older texts. It is probable that the chapters devoted to organic chemistry and to the chemistry of nutrition do not add greatly to the value of the book as a text, but their inclusion can be defended on the ground that the balance is not impaired thereby.

To the student of the science the book has value as a text—to a small group of readers who are not making a special study of chemistry it will also appeal. It is novel, modern, well written. Its arrangement is such, however, that courses in which it is used must be capably directed else serious difficulties may be encountered. It deserves and is likely to receive rather more attention than the general run of such books. HAROLD J. PAYNE.

Sales Management

HANDBOOK OF SALES MANAGEMENT. By *S. Roland Hall*. 995 pages, illustrated. McGraw-Hill Book Co., New York. Price $5.

"As Sales Manager You're Responsible for—"

Can't you imagine this conversation taking place in any of a hundred different plants?

In the past, the X company has grown so rapidly that it has not had time for, nor felt the need of, real sales management—management comparable with the type of control it has maintained in the purchasing or production department. But now that it has attained a real position in its industry, it is awake to the need of a scientific method of training and directing the efforts of its sales force.

Or, the Y company has just been organized by a group of men who realize that their success is going to depend on the most careful supervision of not only purchasing and production—but sales.

Accordingly, the sales manager is called into the president's office. He is given to understand that the training of salesmen, their routing, the establishment of quotas, the overcoming of competition, the supervision of the advertising—in short, all the various details of his work are to be put on a definite basis, instead of being taken care of in the old-fashioned hit or miss fashion, or maybe the sales manager realizes that the old schools of selling based on the premise that "salesmen are born, not made" will no longer stand the acid test of modern competition.

Possibly the sales manager has grown up with the company. He probably started in as salesman, and when the sales force became too large for the head of the company to handle himself, this "star" salesman was called in and made sales manager. Or his training may have been along other lines. But whatever his background, he'll welcome a collection of what the best minds in similar work have found successful practice.

This, in short, is what "The Handbook of Sales Management," by S. Roland Hall, purports to be. A few of the chapter heads will indicate the general type of subjects ably covered by the author; every chapter is replete with examples of how the largest companies in the country are meeting the problems involved: Statistics, Charts and Records; Recruiting of Salesmen; Salesmen's Reports and Letters; The Automobile in Selling; What a Salesman Should Know About Credit; Successful Sales Tactics.

It is the sort of book any one with sales managerial responsibilities will be glad to have handy.

IRVING FELLNER.

Important Technical Articles In Current Literature

"Sanitary Ware Plant Increases Production 800 Per Cent in Four Years." Illustrated description of the plant of the Zwermann Co., Robinson, Ill. Both bisque and glost firing of sanitary ware is done in tunnel kilns. *Ceramic Industry*, August, 1924, pp. 103-108.

"Preparation of H Acid." *Mary L. Willard*. Three methods of preparation are considered, Cassella, Herzog and American. *Color Trade Journal & Textile Chemist*, August, 1924, pp. 40-42.

"The Action of Aqueous Sulphurous Acid on Lignocellulose." *C. F. Cross* and *A. Engelstad*. A study of the reactions involved in the production of pulp by the sulphite process, in which a systematic endeavor is made to throw light on the behavior of the lignones in digestion. Although incomplete, this work marks a step in a field that requires exploration. Following this article is found: "Ligno-sulphonic Acid Obtained by the Action of Sulphurous Acid on Spruce Wood." *Charles Dorée* and *Leslie Hall*. The chief constituent of non-cellulosic substance in sulphite digestion is the lignosulphonic acid $C_{24}H_{30}O_{9}S$. A discussion of the probable formula structure is given. *Journal of the Society of Chemical Industry*, Aug. 1, 1924, pp. 253T-263T.

In Current Foreign Literature

"Silica Gel as an Adsorption Agent, With Special Reference to Petroleum Refining." *Rudolf Koetschau. Chemiker-Ztg.* July 17, 1924, pp. 497-500.

"A Hundred Years of Portland Cement." *K. Goslich. Z. für angewandte Chem.* July 17, 1924, pp. 504-7.

"Material Handling in a Glass Works." *C. Michenfelder. Z. für angewandte Chem.* July 10, 1924, p. 488.

"New Autogenous Welding Devices." *Fr. Messinger. Chemiker-Ztg.* July 10, 1924, p. 476.

News of the Industry

Summary of the Week

The American Chemical Society announces final program for Ithaca meeting, Sept. 8 to 13. Symposium on absorption is a feature.

The Procter & Gamble Co. officially announces intention to carry naphtha soap dispute into Supreme Court if necessary.

Important consolidation of Southern cottonseed oil mills is announced.

Tariff Commission reports record output of dyes in the United States during 1923

Treasury order permits entry of dyes on which no strength standards have been adopted, on basis of actual weight with adjustment when standards have been adopted.

Classification experts of Treasury Department expect to submit their recommendation this week relative to duty on refined nitrate of soda.

American producer of nitrite of soda brings charge of dumping against importers of that chemical.

French and German potash interests sign agreement whereby consuming requirements of United States are allocated.

Stabilization of industry in Germany is expected to bring about keener competition in our export trade in chemicals.

Official figures place valuation of chemical and allied products exported in July as slightly lower than the total for June.

German Competition Threatens U. S. Chemical Export Trade

No detailed analysis of the effect of the Dawes plan on the chemical industry can be made at this time, because only generalities have been worked out. It is not known whether or not the Dawes committee of experts will continue the policies of the Reparation Commission in carrying out annex 6 of the treaty of Versailles. One important point illustrates the uncertainty. Will the Dawes experts require figures of day-by-day production at German dye plants? There has been loud protest in Germany against this procedure. In view of the desire to inspire the Germans with a willingness to work, this requirement, it is thought, might be altered. If such concession is made, however, the chief safeguard against dumping would be lost.

There are no delusions, however, as to the effect of stabilization in Germany on our export trade in chemicals. Taking indigo as an example, it is apparent that we should have to meet new price levels abroad. In 1923 18,000,000 lb. of American indigo was sent to the Far East. Dealers in American indigo were highly successful in competing with the Germans, the British and the Swiss. Two firms selling American indigo sold nearly twice as much as three firms representing German manufacturers. The average price for the American indigo sold at Hankow in 1923 was 30c. The Germans sold at 35c. to 38c. They attempted to justify the higher price on the claim that quality was better.

Production of indigo in Germany has been limited by the general depression and the bad economic situation. As a result a policy was adopted of making the highest possible margin of profit by capitalizing past reputation for superior quality. This policy, which has given such an advantage to the dealers in American indigo, obviously will be discontinued as soon as the German industry begins to thrive again as the rehabilitation of the country is accomplished. While it is impossible to estimate how low German costs may go, it is known that Germany sold indigo in the United States before the war for 11c. a pound. The average selling price of American indigo in the domestic market today is around 20c. It is known that the margin of profit is small. If Germany can produce indigo at anything like pre-war costs, the difficulties of retaining our foreign markets are apparent.

There is no disposition on the part of the American manufacturers to relinquish their foreign trade without a struggle. What has been said of indigo can be said of other commodities. The manufacturers of those commodities are just as determined as are indigo manufacturers to continue the fight for foreign trade. Because of the great advantages that many think could be secured, were these manufacturers to join in an association under the Webb-Pomerene act, it is expected that there would be increasing consideration given such a plan as the German industry responds to the stabilization of affairs and becomes a greater factor in world markets.

French and German Interests Sign Potash Agreement

The agreement reached on Aug. 14 at Basel between the German Potash Syndicate and the Société Commerciale des Potasses de l'Alsace was signed by both parties on Aug. 27. This agreement regulates the sale of potash to the United States, the allocation giving German producers 62½ per cent of American requirements and the remainder, or 37½ per cent, to be filled from Alsatian mines. Earlier reports had erroneously stated that the German mines would fill 67½ per cent of American requirements. The agreement is to extend for 3 years. If it is amplified so as to include an understanding as to the allocation of the requirements for the entire world, the American percentages will be changed, with the Germans to receive a higher percentage.

Treasury Order Expedites Entry of Foreign Dyes

In view of several decisions of the Board of General Appraisers, the Treasury Department has directed customs officials to estimate duties on imported dyes for which no standards of strength have been adopted on the basis of the actual weight, final liquidation of the entry to be made after a standard has been adopted on the basis of the weight which the colors would have if diluted to the standard strength. This order is expected to eliminate delay in getting certain colors through the custom houses.

Chemical Exports Declined Slightly in July

Valuation a Little Below the Total for June—Imports of Dutiable Chemicals Also Fall Off

Chemical and allied products valued at $8,461,497 were exported during July. This represents a slight decrease as compared with June, when the total was $8,853,533. Exports of coal-tar products, however, increased during July, practically reaching the $900,000 mark. The most important contribution to the total was furnished by benzol. That commodity to the extent of 7,749,755 lb. was exported during July, almost double the June forwardings. Coal-tar colors, however, show a marked upturn. They were exported to the extent of 1,818,873 lb.

The soda group contributed to the July decrease. Total exports under that head amounted to 22,685,494 lb., a decline of nearly 4,000,000 lb. Exports of pigments, paints and varnishes in July were valued at $1,061,118, also a decline as compared with June.

There was a sharp upturn, however, in exports of fertilizer. The July total was 98,503 tons, nearly 28,000 tons in excess of the June figure. There was a corresponding increase in shipments abroad of sulphate of ammonia, the total being 9,081 tons.

Exports of explosives registered a slight decline. The July total was 275,974 lb.

Comparative figures covering the export of certain of the chemical commodities follow:

	July 1923	July 1924
Benzol, lb.	27,146,252	7,749,755
Sulphuric acid, lb.	797,106	640,967
Acetate of lime, lb.	2,946,051	3,195,825
Bleaching powder, lb.	2,569,848	1,664,109
Chlorate of potash, lb.	9,008	15,594
Bichromate of potash, lb.	41,517	87,269
Cyanide of soda, lb.	1,097,020	86,741
Soda ash, lb.	2,910,738	2,943,970
Soda caustic, lb.	11,288,786	8,715,062
Sulphate of ammonia, tons	17,751	9,081

Imports of free list chemicals were slightly higher in July than was the case in June, but there was a decline in the imports of chemical commodities on the dutiable list. Free list chemicals valued at $4,446,644 and dutiable chemicals valued at $2,367,923 were brought into the country during June. There was a striking decline in the imports of coal-tar chemicals. In June this total was $2,552,015. It dropped to $881,474 in July. Imports of creosote oil declined one-third, as did imports of pyridine, while imports of tar and pitch declined one-half. At the same time there was a marked upturn in the imports of intermediates. Colors, dyes and stains declined from 253,913 lb. in June to 238,968 lb. in July.

Fertilizer imports were considerably larger in July, when the total was 86,770 tons. This compares with 53,592 tons in June. Larger receipts of nitrate of soda, which passed the 50,000-ton mark, were largely responsible for the increase, although there was a gain as well in phosphate material and in imports of muriate of potash. Imports in the paint group values fell $287,393 to $235,639.

Comparative figures covering the imports of certain commodities are shown by the following:

	July 1923	July 1924
White arsenic, lb.	1,212,354	1,537,902
Citric acid, lb.	33,600	33,600
Formic acid, lb.	13,611	71,363
Oxalic acid, lb.	172,925	169,158
Tartaric acid, lb.	280,000	267,038
Copper sulphate, lb.	....	161,200
Potassium carbonate, lb.	79,438	594,773
Potassium hydroxide, lb.	226,269	756,934
Potassium chlorate	....	678,635
Sodium cyanide, lb.	2,386,354	1,206,278
Sodium ferrocyanide, lb.	33,797	346,182
Sodium nitrite, lb.	134,583	1,151,375
Sodium nitrate, tons	58,196	50,400
Creosote oil, gal.	4,894,108	4,568,587
Naphthalene, lb.	3,167,958	1,127,047

Record Production of Dyes

Average Sales Price for All Dyes in 1923, However, Was Lower Than in Preceding Years

The United States Tariff Commission will soon issue its seventh annual report on the Census of Dyes and Coal-Tar Chemicals for the calendar year 1923. This report shows a record output for the year 1923, with conspicuous progress in the production for the first time in this country of many important dyes and other synthetic organic chemicals, as well as a further reduction in selling prices.

The domestic production of dyes in 1923 by 88 firms was 93,667,524 lb., the largest in the history of the domestic industry. During 1922 the output by 87 firms was 64,632,187 lb. The total sales for 1923 was 86,567,446 lb., with a value of $47,223,161. Our pre-war production in the year 1914 by 7 firms was 6,619,729 lb., valued at $2,470,096. The output was then dependent upon foreign countries, as most of the intermediates were imported, chiefly from Germany. Among the more important factors responsible for the large output in 1923 may be mentioned:

(1) The activity of the domestic textile and dye-consuming industries.

(2) The occupation of the Ruhr, which caused a reduction in the output of the German dye factories and consequently enabled the domestic producers to increase their exports of indigo, sulphur black and certain other dyes, principally to the markets of the Far East.

(3) The relatively high foreign price levels of dyes compared with those of the pre-war period.

The average sales price of all dyes for 1923 was $0.545 per pound, compared with $0.60 in 1922, $0.83 in 1921 and $1.26 in 1917, the first year of which a census of dyes and coal-tar chemicals was compiled by the Tariff Commission.

Production of New Dyes

During 1923 nearly 100 dyes were produced for which no production in the United States had been shown in 1922. In addition, other dyes that had been reported previously in small quantities were manufactured on a substantial commercial scale. These comprise for the most part dyes of the specialty type, of greater complexity and more difficult and costly to manufacture. New products include dyes for silk, cotton, wool, color lakes and other purposes, and are representative of the different classes of dyes by chemical classification. The domestic industry, although deficient to some extent in the production of certain vat dyes and other colors, supplies more than 95 per cent of the domestic requirements.

The production of vat dyes (other than indigo) in 1923 was 1,766,383 lb., the largest in the history of the industry, an increase of 690,391 lb. over that of 1922. This class of dyes produces shades of high fastness on cotton goods that will stand the modern laundry treatment. As the public is appreciating more and more the value and importance of fast dyes, the consumption of this group is increasing, and their increased production is a notable development of the domestic industry. The production of synthetic indigo during 1923 was 28,347,259 lb.

The imports of synthetic dyes in 1923 were 3.3 per cent of the total production by quantity and 6.2 per cent by value. Imports were accordingly by quantity 3.9 per cent of the apparent consumption, assuming this to equal production plus imports minus exports. Dyes produced in the United States accordingly supplied about 96 per cent of the apparent consumption of coal-tar dyes, and there was, in addition, an exportable surplus of certain dyes amounting to about 18,000,000 lb.

The output of dyes in 1923, grouped by classes according to the method of application, was as follows: acid dyes, 12,498,817 lb., or 13.34 per cent of the total output; basic dyes, 4,157,373 lb., or 4.44 per cent; direct cotton dyes, 16,858,387 lb., or 18 per cent; mordant and chrome dyes, 4,078,504 lb., or 4.35 per cent; sulphur dyes, 21,558,469 lb., or 23.2 per cent; vat dyes, including indigo, 30,113,642 lb., or 32.15 per cent; indigo, 28,347,259 lb., or 30.26 per cent; other vat dyes, 1,766,383 lb., or 1.89 per cent; lake and spirit soluble dyes, 1,171,854 lb., or 1.25 per cent; unclassified and specialty dyes, 3,230,478 lb., or 3.45 per cent of the total.

Southern Cottonseed Mills Form Consolidating Organization

The National Cottonseed Products Corporation, Memphis, Tenn., has been chartered under Delaware laws with a capital of $8,000,000, to take over and consolidate a number of cottonseed oil mills in this vicinity. The initial merger will comprise the Dixie Cotton Oil Co. and the Jefferson Cotton Oil Co., Memphis; Planters Cotton Oil Co., Pine Bluff, Ark.; Roberts Cotton Oil Co., Jonesboro, Ark., Malden, Mo., and Cairo, Ill.; Tennessee Cotton Oil Co., Jacksonville, Tenn.; Cotton Seed Products Co., Louisville, Ky., and the Covington Cotton Oil Co., Tiptonville, Tenn. Other Memphis companies are expected to affiliate at an early date, including the Crescent Cotton Oil Mill, Valley Cotton Oil Mill, Bellevue Cotton Oil Co. and the Gayeso Cotton Oil Co. The new organization will have a gross capacity for crushing about 3,000 tons of cotton seed daily. Edward Cornish, Chattanooga, Tenn., will be president of the new company, and W. F. Bridewell will be general manager.

Washington News

Paris Trade Commissioner Appointed

Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce, has announced the appointment of Daniel J. Reagan, of Terre Haute, Ind., as trade commissioner to Paris, France. Mr. Reagan, who is a graduate of Columbia University, has been connected with the Bureau of Foreign and Domestic Commerce for the past year and a half as editor of the Commerce Year Book. Prior to his association with the bureau Mr. Reagan served successively with the Hocking Valley Products Co. as plant superintendent, with the International Commercial Co., a general export and import corporation, as secretary-treasurer, with the Raymond Engineering Corporation of New York, in charge of plant organization and equipment purchases and with the McGraw-Hill Co., Inc., New York, as advertising specialist and market investigator.

As trade commissioner at Paris he will give particular attention to studies of metallurgical and allied industries. Mr. Reagan will sail for his new post in the early part of September.

Decision on Nitrate of Soda Duty Expected This Week

Having completed submission of the briefs filed in the sodium nitrate classification case to appraising experts at the major ports, classification experts of the Treasury Department expect to be able to submit their recommendation to the Secretary this week. The question of whether refined nitrate shall be classified as dutiable under the 1922 tariff act hangs in the balance. The odds appear to favor a decision holding both refined and crude nitrate as entitled to free entry, however.

Reparation Dyes Aid in Filling Greek Requirements

In a report from Athens, Consul-General W. L. Lowrie states that about 63 tons of dyestuffs, delivered to Greece by Germany on reparation account according to the treaty of Versailles, is still held for disposal by the Greek Government. Sooner or later this quantity will be taken up by the local consuming industry, and during the next 12 months at least will offset any increase in the consumption of dyestuffs resulting from the newly established and growing Oriental carpet industry in Greece.

The only important Greek dyestuff works are the Manufactures de Matières Celorantes du Piree, S. A. Oeconomides, Piræus, which started manufacturing in 1899 and gradually increased its production to 107 tons of complete dyestuffs in 1922. In 1923, owing to the crisis in the textile industry, it produced only 63 tons. It claims to manufacture in its own factory eight-tenths of the necessary intermediates, such as H acid, benzidine, dimethylaniline, α-naphthylanine, β-naphthol, α-naphthol and distillation of acetic acid, as well as nearly the complete range of direct, acid, basic and sulphur colors for cotton, wool, silk, leather, shoe polish and fat dyeing, and also the alizarin and aniline colors for dyeing carpets. It is believed, however, that many of these dyes are obtained by the treatment of imported highly concentrated colors which are reduced to a lower degree of concentration and fastness and are thus sold at cheaper prices for use in the inferior class of domestic textiles.

Concentrated Fertilizers to Be Tested in Field

A co-operative research is now being organized by the Fixed Nitrogen Research Laboratory, the Bureau of Soils and the Bureau of Plant Industry to make an extensive series of field tests on concentrated fertilizer materials. This work will be an elaboration and a large-scale application of the principle used by the various institutions previously in pot and plot tests.

Probably the materials used will be ammonium nitrate, ammonium phosphate, urea, potassium nitrate and potassium phosphate. They will be compared on quarter-acre or half-acre plots with standard fertilizers used in quantities to give the same amount of plant food per acre. The tests will be on the most important fertilizer-using crops, such as cotton, potatoes, corn, tobacco, etc. Tests will be made on various types of soil in various parts of the country.

The main object of the work, which will begin with winter wheat planting this fall, is to show how actual farm equipment and farm methods can successfully utilize these concentrated materials. Therefore the work will be done on actual farms, not on plots owned or controlled by experiment stations or the government.

This work was started with the idea that concentrated fertilizer materials are going to be available commercially within a few years. Therefore it is very important to have practical farmer tests that will convince other farmers that they can be used successfully under farm conditions.

Soap Dispute Remains Unsettled

The Procter & Gamble Co. will contest in court, if need be up to the United States Supreme Court, the recent decision made by the Federal Trade Commission in regard to the naming of Procter & Gamble White Naphtha Soap.

The word "naphtha" was the designation in dispute. The Procter & Gamble Co. holds that its white naphtha soap contains a proper amount of naphtha to assure the best washing results, although the commission ruled that the word "naphtha" was to be discontinued in the company's advertising because of its interpretation of that word.

What the new definition of naphtha soap will be has now become a highly scientific problem, which rests with the courts for decision. The matter of the standardization of naphtha soap, which is at present an open one, will then be settled for all manufacturers alike.

The case before the Federal Trade Commission raised entirely technical questions and did not deal with or decide upon the merits of the product. Neither the consumer nor the dealer was in any way involved. In all highly competitive commercial fields, questions of interpretation and meaning are constantly arising, and such a decision as was made is purely of academic interest.

"P and G the White Naphtha Soap" was first marketed in 1904 and from a small beginning has developed to a point where it is claimed to be the best selling brand of laundry soap in America.

Regardless of what the decision of the courts may be as to what the designation "naphtha" stands for, Procter & Gamble will continue to manufacture P and G the White Naphtha Soap and to conform to such specifications as may be established.

Census Report Shows Gain in Production of Glue

The Department of Commerce announces that, according to data collected at the biennial census of manufactures, 1923, the establishments engaged primarily in the manufacture of glue and gelatin reported products valued at $24,366,097, an increase of 14.2 per cent as compared with 1921, the last preceding census year. This industry classification covers establishments engaged primarily in the manufacture of flexible and liquid glue, gelatin, and glue jelly or paste, derived from hides, bones, fleshings and fish.

In addition, glue and gelatin are manufactured to a considerable extent as secondary products by establishments engaged primarily in other industries, principally slaughtering and meat packing and the manufacture of fertilizer. The value of these commodities thus produced outside the industry proper in 1921 was $4,277,256, an amount equal to 20 per cent of the total value of products reported for the industry as classified. The corresponding value for 1923 has not yet been ascertained, but will be shown in the final reports of the present census.

New Tannin Extract Company Formed in Australia

Assistant Trade Commissioner Elmer G. Pauly reports from Melbourne that a new company, the Australian Tanning Extract & Bismuth Co., has been formed with a new factory near Merimbula, New South Wales, in which modern machinery has been installed for the production on scientific lines of wattle-bark extract. According to reliable information, this plant is understood to have a daily capacity of 3 tons of extract.

Symposium on Absorption Is Feature of Ithaca Meeting

American Chemical Society Announces Program for Gathering Next Week at Cornell University

One feature of the fall meeting of the American Chemical Society that is to be held at Cornell University from Sept. 8 to 13 is the symposium on the unit process of absorption to be held by the Division of Industrial and Engineering Chemistry. Prof. W. G. Whitman, of M.I.T., is chairman of this symposium and has arranged for the presentation of ten papers that are expected to provide a well-rounded treatment of the subject.

The program in general runs true to form, with somewhat fewer papers scheduled in several sections than ordinarily. Registration is to be at Cornell's new chemical laboratory, the construction of which has but recently been completed. The building is the gift of George F. Baker, of New York, and bears his name.

Foreign Scientists to Speak

Monday, the opening day of the meeting, is to be devoted to registration and to meetings of the Council, scheduled for both afternoon and evening. On Tuesday morning the convention will be officially welcomed at Bailey Hall by President Livingston Farrand, of Cornell, who will then surrender the chair to L. H. Baekeland, president of the society. At this time three addresses are to be delivered by eminent foreign scientists, several of whom are expected to be present at the meeting. Sir Max Muspratt, United Alkali Co., Liverpool, will speak on "Chemistry and Civilization"; Prof. S. P. L. Sorensen, Carlsberg Laboratory, Copenhagen, has chosen as his topic "Serum Globulins," and Sir Robert Robertson, president of the Chemical Section of the British Association for the Advancement of Science, will discuss "The Chemistry of the Trinitrotoluenes." During the afternoon Tuesday the new laboratory will be described by Dr. L. M. Dennis, director of the department of chemistry at the university. Opportunity will then be provided for inspecting the building. In the evening entertainment for members and guests is to be provided at Bailey Hall.

The sectional meetings are planned to begin on Wednesday morning and to continue in a few cases through one session on Friday. On Wednesday evening Dr. Baekeland is to deliver the presidential address, "Prospects and Retrospects," and Dr. Farrand is to speak on "Science and the Nation's Wealth."

Group dinners will be held Thursday evening, followed by an organ recital at Sage Chapel. Friday afternoon and evening are to be given over entirely to recreation, with a boat ride on Cayuga, golf and tennis, and a dinner and dance at Glenwood on Cayuga in the evening. Those who desire may take trips to points of industrial interest on Saturday morning.

The number of papers to be included in the various sectional meetings are as follows: Agriculture and Food Chemistry, 15, including a joint symposium with the Fertilizer Section on "Soils, Fertilizers and Crops"; Fertilizer Chemistry, 17; Organic, 31; Biological Chemistry, 16; Sugar Chemistry, 12, including a joint session with the Cellulose Division to discuss photosynthetic sugars; Industrial and Engineering Chemistry, 14, of which 10 are to be devoted to a symposium on absorption; Gas and Fuel Chemistry, 12, with 7 other papers especially arranged for the discussion of coal storage and spontaneous combustion; Physical and Inorganic Chemistry, 32; Petroleum, 19; Medicinal Products, 6; Water, Sewage and Sanitation, 9; Dye Chemistry, 6; Paint and Varnish, 7; Leather and Gelatin, 11; Rubber, 7; Chemical Education, 15; Cellulose, 8; and History of Chemistry, 11.

Special attention is called to the fact that in order to obtain reduced fare to the meeting, members must obtain identification certificates before purchasing their tickets.

News in Brief

Pittsburgh Gas Merger Grows—The natural gas consolidation being planned in Pittsburgh will be augmented by the addition of the Peoples Natural Gas Co. and the Fayette County Natural Gas Co. The former concern, one of the largest in the industry, is controlled by the Standard. The merger will bring together properties valued at well in excess of $100,000,000.

Canadian Paper Men Want 48-Hour Week—A resolution urging the Federal Government to adopt legislation limiting to 8 hours per day, or 48 hours per week, work in pulp and paper factories of Canada was unanimously adopted at the congress of pulp and paper mills industries of Canada, which was held recently at Port Alfred, Ont.

Canadian Concern to Manufacture Rubber Goods—The Quebec Rubber Co. Ltd., has been incorporated in Quebec with a capital stock of $1,500,000 to manufacture and generally deal in rubber and gutta percha and all articles in which rubber is used.

International Paper More Active—Following a shut-down since June, the International Paper Co., New York, has arranged for the immediate resumption of production at its Glens Mills at Berlin, N. H., used for the manufacture of newsprint, with intention of developing full capacity at an early date. Three other newsprint mills of the company were closed down about the same time in June, and it is expected that one or more of these will be placed in service in the near future.

Large Loadstone Deposit Found—A sample of loadstone, found on the property of the Mississauga Exploration & Development Co. near Sault Ste. Marie, Ont., will pick up nails, paper clips, etc., in the same manner as a neatly fashioned horseshoe magnet. This metal has been found across 40 ft. in a 300-ft. vein and occurred through a half-mile stretch.

Portable Oil Refinery a Success—A portable oil refinery recently installed in the Luling oilfields of Texas has been subjected to a series of practical tests and has produced results that indicate a pronounced success. The plant is mounted on a specially designed truck, capable of being hauled over any standard-gage railroad line; it can be made ready to handle crude oil within 9 to 10 days, and if for any reason the flow or field fails and removal to another point is necessary, the refinery can be disconnected on short notice.

U. S. Syndicate May Develop Canadian Asphalt and Oil—In a statement made in Winnipeg recently, Robert M. Birck, of Chicago, oil operator and president of the Blackstone Petroleum Co., said there seemed every probability, if investigations on the spot proved satisfactory, that in the near future a powerful United States syndicate would be in operation for the extraction of oil and asphalt from the sands of the Athabasca River in Alberta.

To Carbonize Lignite—The American By-Products Corporation, through its chief engineer, K. F. Vaugn, announces that his company is contemplating the design and erection of a lignite-carbonizing plant of 250 tons per day capacity. The final plant will have a capacity of 2,000 tons of dry lignite per day. The company has purchased 1,000 acres of lignite-bearing lands in Cowlitz County, Washington, near which the plant will be built, but the exact location has not been selected. The process is known as the Gorden multiple-unit retort process.

Canadian Newsprint Gains Again—Canadian newsprint production during July amounted to 113,479 tons, as against 105,176 tons in July, 1923. Canadian production is rapidly overtaking that of the United States, whose output for July was 113,952 tons. Production in Canada for the first 7 months of 1924 shows an increase of 9 per cent compared with the same period in 1923 and 31 per cent compared with the first 7 months in 1922.

No Chemical Exposition This Year—Owing to some confusion that is believed to exist in a few quarters regarding the holding of the next chemical exposition, an announcement has been sent out by the International Exposition Co., under whose management the Exposition of Chemical Industries has been held since 1915, to the effect that there will be no chemical exposition in 1924. The next Exposition of Chemical Industries will be held Sept. 28 to Oct. 3, 1925, at the Grand Central Palace, New York.

Large Production of Rubber—World's production of crude rubber will be 421,000 tons in 1924, of which the United States will use 315,000 tons, according to estimates current in England.

Men You Should Know About

HIRAM S. BROWN has been elected president of the Central Leather Co., New York, succeeding George W. Childs, recently resigned in order to devote his entire attention to production and research. Mr. Brown is an engineer, heretofore connected with Sanderson & Porter, New York, engineers.

Prof. ARTHUR J. CLARK, chemistry department, Michigan Agricultural College, is concluding an investigation of chemical properties at Death Valley, Calif., under the authorization of the Michigan Securities Commission.

Dr. P. M. GINNINGS has resigned as professor of chemistry at Centenary College of Louisiana, Shreveport, La., to become professor of chemistry at North Carolina College for Women at Greensboro, N. C.

E. D. GOLDWAITHE has been appointed by Secretary of Commerce Hoover to make a survey of the export field in oils and fats for the department. Mr. Goldwaithe was formerly assistant chief engineer for the American Cotton Oil Co., New York, and lately technical adviser to the Philippine Government in connection with the vegetable oil idustry.

FRANK B. GORIN, of the staff of the Chemical Division of the Department of Commerce, will spend his vacation on duty in the office of the chief of the Chemical Warfare Service. He will assist in bringing up to date the procurement plans of that service and will reduce to concrete form the exact type of co-operation that would be expected from the dye industry.

SAMUEL M. MONEYPENNY has been appointed manager of the heavy chemical department of H. J. Baker & Brother, New York, chemical manufacturers, succeeding Albert J. Lacey, resigned.

WILLIAM R. MOTT, research chemist, Union Carbide & Carbon Research Laboratories, Long Island City, N. Y., has taken a leave of absence in order to recuperate fully from an attack of sleeping sickness he experienced about 2 years ago.

R. L. PRICE, who has for some time past been director of the School of Chemical Engineering Practice maintained by the Massachusetts Institute of Technology at the plant of the Eastern Manufacturing Co., Bangor, Me., has severed his connection there to become associated with the Miner Laboratories, consulting engineers and chemists, Chicago, Ill.

Dr. ALBERT SALATHE has resigned as professor of chemistry at Sweet Briar College, Sweet Briar, Va., to become professor of chemistry and head of the science departments at Centenary College at Shreveport, La.

RAYMOND B. SAWYER has resigned as associate in science at Centenary College at Shreveport, La., to accept a similar position in Marietta College, Marietta, Ohio. His place at Centenary will be taken by A. B. King.

C. B. SEGER, president of the United States Rubber Co., New York, has been elected chairman of the finance committee of the Union Pacific Railroad Co. He will retain his connection with the first-noted company.

ROBERT O. SWEEZEY has been elected president of the Port Arthur Pulp & Paper Corporation.

Dr. CHARLES J. THATCHER sailed for Europe with his family on Aug. 23. As he is contemplating a tour of the world, it may be a year before he returns to New York.

L. VOGELSTEIN, chairman of the board of directors of the American Metal Co., New York, has returned to his desk after an extended trip to Europe.

L. R. WILSON has been elected vice-president of the Abitibi Power & Paper Co., Ltd. Mr. Wilson retains his position as managing director of the company.

Obituary

WILLIAM DANIEL HURD died last week at his home in Washington after an illness of 2 months. He was born in Detroit, Mich., nearly 49 years ago and was graduated from Michigan Agricultural College in 1899. Since then and until 1919 Professor Hurd taught in agricultural schools, being associated with Massachusetts Agricultural College for 10 years as director of extension service. In 1919 he became Western manager of the soil improvement committee of the National Fertilizer Association and in the following year he undertook the direction of this important work—a post that he held until his death. To Professor Hurd belongs the credit of the able work that this committee carried out in the direction of standardization and simplification of fertilizer practice—a work that was made possible and effective because of the confidence that was placed in him by both farmer and manufacturer.

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William Daniel Hurd

LOUIS MAYER, leather manufacturer, partner in the R. Newman Co., Hoboken, N. J., died at his home at East Orange, N. J., Aug. 14, aged 65 years. He is survived by his wife, a son and two sisters.

FRANK M. NIEMTIMP, superintendent of the testing department, Eastman Kodak Co., Rochester, N. Y., died at his home in that city Aug. 22. following a short illness, aged 49 years. He had been connected with the Eastman company for the past 28 years.

J. O. THOMPSON, for the past 17 years manager and assistant treasurer of the Sibley Soap & Chemical Co., Franklin, Pa., died at his home in that city, Aug. 20, following a sudden illness, aged 49 years.

HENRY J. WANNER, well-known steel manufacturer, founder of the Hammond & Wanner Malleable Iron Companies, Chicago, Ill., died in that city after a brief illness on Aug. 18.

Calendar

AMERICAN CERAMIC SOCIETY, Los Angeles, Calif., Oct. 6 to 7.

AMERICAN CHEMICAL SOCIETY, sixty-eighth meeting, Cornell University, Ithaca, N. Y., Sept. 8 to 13.

AMERICAN ELECTROCHEMICAL SOCIETY, Detroit, Oct. 2 to 4.

AMERICAN FOUNDRYMEN'S ASSOCIATION, Milwaukee, Wis., Oct. 11 to 16, 1924.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pasadena, Calif., Oct. 13 to 17.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, Birmingham, Ala., Oct. 13 to 15.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, New York, Dec. 1 to 4.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERING, New York, Dec. 1 to 3.

AMERICAN SOCIETY FOR STEEL TREATING, Boston, Sept. 22 to 26.

FRANKLIN INSTITUTE CENTENNIAL, Philadelphia, Sept. 17 to 19.

MANAGEMENT WEEK. Auspices of American Society of Mechanical Engineers, New York City, Oct. 20 to 25.

NATIONAL SAFETY COUNCIL, Louisville, Ky., Sept. 20 to Oct. 3.

PACIFIC COAST GAS ASSOCIATION, Santa Barbara, Calif., Sept. 15 to 19.

TECHNICAL ASSOCIATION OF THE PULP & PAPER INDUSTRY, Hotel Statler, Buffalo, N. Y., Oct. 14 to 15.

Paper Men to Meet in Buffalo

The fall meeting of the Technical Association of the Pulp and Paper Industry will be held in Buffalo at Hotel Statler Oct. 14 to 15, 1924. Following the business session the subsequent meetings will be devoted to the discussion of such problems as vocational education and training, paper drying operation tests, paper testing and relative humidity conditions, revision of the standard method of testing pulp for strength, prevention of waste in the mill effluent and stream pollution. The fall meeting, according to established custom, will be given up to the consideration of practical manufacturing problems.

Steadier Tone in Chemical Market Throughout August

Buying Orders Gain Gradually in Volume—Prices Are on Firmer Basis

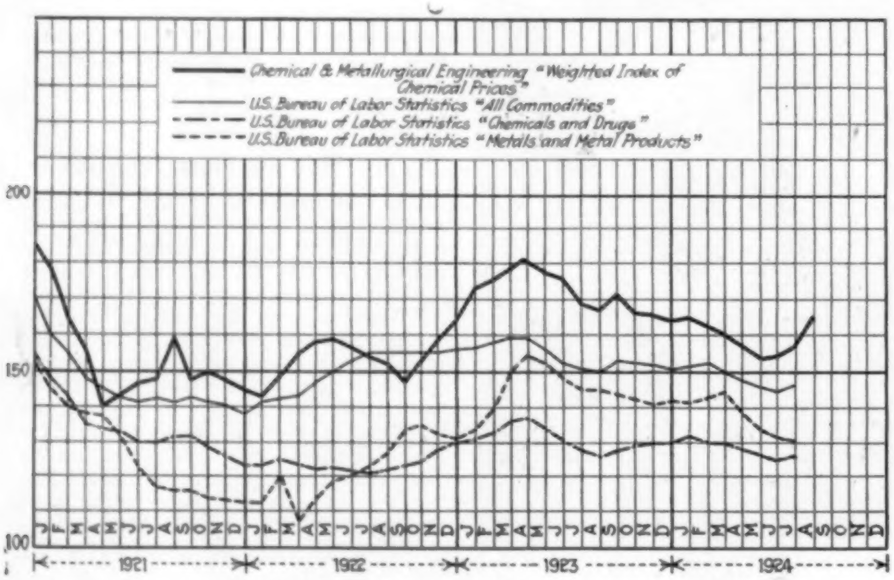
Industries which are large consumers of chemicals and allied products continued to expand operations throughout the past month. As a result there was an improved demand for contract deliveries of raw materials. Buying for new account also was more consistent. The greatest improvement, however, was found in the optimistic sentiment which pervaded trade circles. Favorable crop reports, a better situation abroad, lack of labor troubles, etc., have combined to generate the belief that fundamental conditions point to a period of activity in industry.

While plant operations are still going along on a reduced basis, the tendency has been to expand and in many lines production has been on a larger scale than in the months immediately preceding. During the period of reduced output, stocks of chemicals and kindred products are said to have been reduced. Supplies in consumers' possession also have been held down by the protracted period of slow buying and these facts are pointed to as an indication that values are in a position to respond to a more active trading period.

The weighted index of *Chemical & Metallurgical Engineering* shows an average of 165.07 for the month. This figure bears out reports that prices are recovering from the low levels reached earlier in the year, as the weighted number for July was 157.48 and for June, 163.62. Higher prices for important allied products have exerted considerable influence in the advance of the weighted index number. However, in the strictly chemical list there has been an improvement which it is difficult to measure in a definite way. It may be expressed by saying that many chemicals in preceding months, while nominally quoted on an unchanged basis, were subject to price cutting without any actual change being announced in the sales price. In the past month there has been less willingness on the part of sellers to deal on private terms—and the degree of selling pressure has been materially reduced.

Latest official figures for the export and import trade in chemical products cover the month of July. In both these branches of the industry the totals for July are disappointing. Export shipments in July were lower in valuation than those for June and imports also compared unfavorably with those for the preceding month. Trade with foreign countries in August improved in the case of certain chemicals but no figures are available on which to base comparisons for the industry as a whole.

Among the developments of the month in tariff matters was the presentation of briefs by parties interested in the tariff status of refined nitrate of soda. It had been contended that the wording of the present tariff act did not include this chemical on the free list. Opposition to this view was voiced by consumers and importers and classification experts of the Treasury Department were asked to make a recommendation. Up to the end of the month a recommendation had not been made. Another chemical under investigation by customs authorities was nitrite of soda. This arose from charges that nitrite of foreign origin was offered for sale in this country at prices lower than it could be bought in European countries. Hence an investigation was ordered under the provisions of the anti-dumping clause of the tariff act.



Silesia Curtails Output of White Lead and Zinc Oxide

According to a report of M. Tervea, French Consul at Breslau, construction of all kinds in Silesia was of little importance throughout 1923 and consequently the demand for white lead was small. High manufacturing costs served to prevent competition in foreign markets, so that toward the end of the year the production of white lead completely ceased.

Although local consumption of zinc oxide was small, the Rhenish factories were hard pressed throughout the year to fill their foreign orders.

Trade Notes

Samuel Lamensky, a silk manufacturer at Paterson, N. J., died suddenly at his home in that city, on Aug. 25.

Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce, has announced the appointments of James F. Hodgson, of Hattonfield, N. J., as assistant trade commissioner to Warsaw, Poland, and of James H. Smiley, of Haverhill, Mass., as assistant trade commissioner to Shanghai, China.

Frank M. Smith, the surviving partner of H. J. Baker & Bro., importers and dealers in chemicals and fertilizer materials at 81 Fulton St., New York, has formed a copartnership under the name of H. J. Baker & Bro. and will have as associates Edward A. Buck, Charles D. Rafferty, James K. Welsh and H. V. B. Smith.

At the seventy-second annual convention of the American Pharmaceutical Association held in Buffalo last week, Charles W. Holton, of Newark, N. J. was elected president for the ensuing year.

The Boulder Tungsten Production Co., of Boulder, Colo., has been granted a war minerals relief claim of $12,180.

Acting Commercial Attaché E. G. Babbitt, Tokyo, in his report for the week ended June 28, stated that applications for permits to import foreign dyestuffs in accordance with the recent dyestuff import restriction ordinance are reported, when the time for application terminated on June 20, as representing about 20,000,000 lb. This is more than the average yearly import figure.

The Merrimac Chemical Corporation has been incorporated with capitalization of $100.000. Incorporators are H. M. Hogan, C. R. Carroll and F. J. Davis. Address is given as 224 West 57th St., New York.

Financial

The Certain-teed Products Corporation for the 6 months ended June 30 reports net profit of $503,607 after charges, federal taxes, depreciation, etc., equivalent after preferred dividends to $2.64 a share earned on the 92,000 shares of common stock of no par value. This compares with $663,-425, or $4.56 a share, in the corresponding period of 1923.

Reports from London say that a statement of the Diamond Match Co., Ltd., for the 6 months ended June shows earnings from all sources $2,030,-839. Deducting taxes, $142,791, depreciation and amortization, etc., $554,-203, insurance and timber reserve, $175,000, leaves net earnings $1,158,-845, less reserve for federal taxes, $260,319, leaving $898,525, plus $4,057,-462 brought in, making $4,955,987. Dividends paid in March and June absorbed $678,604, leaving a balance at June 30, 1924, of $4,277,383.

Market Conditions

Demand for Chemical Products Extends to Round Lots

Widening of Operations in Consuming Industries Leads to Volume Sales of Various Commodities

WITHOUT taking on an appearance of activity, trading in chemicals and allied products has been undergoing a marked change. During the period when depression was most pronounced in manufacturing lines, buying of raw materials was reduced to small quantities and contract withdrawals were cut down to a minimum and in some cases were entirely suspended. Greater activity in the textile, leather, paper, and other industries has stimulated deliveries against standing orders and has enlarged the scope of buying additional lots. Sellers report that present inquiries are running to round lots as distinguished from the hand-to-mouth buying of a month ago.

The weighted index number shows a sharp decline for the week. The number is influenced mainly by price recessions in basic allied materials which were responsible for the recent upturn in the index. For instance, crude cottonseed oil, which had moved upward sharply in the face of small stocks, was unable to hold the higher level when revised cotton reports indicated a large supply of seed and oil for the new crop year. Important chemicals have changed but little in price but the tendency to offer concessions has been reduced and the undertone to chemical prices is firm.

Import and export trade, as revealed in Department of Commerce figures just made public for July, has been quiet and has been a factor in contributing to the quiet tone to the market in the past 2 or 3 months.

Nitrite of soda is again under investigation under the tariff act. The initiative was furnished by a charge that foreign producers were using this country as a dumping ground. Hence the anti-dumping clause has been invoked and government officials have called for the complete evidence which was compiled when this chemical was under investigation prior to the recent advance in import duty. Action also is expected soon on the question of duty as referred to refined nitrate of soda.

Acids

Some of the acids which were in good demand a short time ago are now moving irregularly. This is true of tartaric and citric acids but the falling off in consuming demand is seasonal. Imports of tartaric acid in July were 267,038 lb. as against 280,000 lb. in July last year. Imported tartaric is quoted at 27c. per lb. with domestic at 30c. per lb. Imported citric is said to be easy at 45½c. per lb. and domestic makers ask 46@47c. per lb. Acetic acid is moving regularly on old contracts with some improvement in new business. Prices are steadied by the unchanged position of raw materials. Oxalic acid is holding at 9½@10c. per lb., according to seller and quantity, but competition is still keen and it is difficult to forecast the future position of this acid. Lactic acid is meeting with a better outlet and reserve stocks are in firm hands. Mineral acids are improving very slowly and it will take some time to reduce surplus carryings to a point where firm markets may be expected.

Denatured Alcohol Advanced in Price — Caustic Potash Higher—Prussiates Lower in All Positions — Imported Sal Ammoniac More Active — Bichromates Easy — Bleaching Powder Firmly Held — Sulphate of Ammonia Sparingly Offered—Arsenic Dull and Easy

Potashes

Bichromate of Potash—Export business in July showed improvement, as outward shipments were 97,269 lb., which compares with 41,517 lb. in July, last year. Buying for domestic account has gained recently but has been stimulated by lower prices and the price tone at present is easy. Open quotations are 8⅞c. per lb., but according to reports buyers find no difficulty in securing supplies at 6¾c. per lb.

Caustic Potash—Reports of an agreement among foreign producers have reached the market and have served the two-fold purpose of strengthening values and of increasing demand. There was a notable increase in inquiry and business placed was fairly large. Spot material sold at 6¾c. per lb. and some holders marked up their prices to 6⅞c. per lb. The shipment price also was higher and was given as 6⅞c. per lb. Toward the latter part of the week there were numerous bids in the market at 6⅝c. per lb. for spot caustic but they did not find sellers. Imports of caustic potash in July are officially given as 756,934 lb. as compared with 226,269 lb. in July last year.

Permanganate of Potash—Only occasional demand is heard and the past week has seen very little demand from consumers. Prices are dependent on seller but it is stated that 13½c. per lb. can still be done with general asking prices at 13¾@14c. per lb.

Prussiate of Potash—The soda product was easier in price last week and holders of yellow prussiate of potash also were willing to sell at prices more favorable to buyers. Spot material was openly offered at 17½c. per lb. Shipments from foreign points were quoted at 17c. per lb. More interest was reported and the lower prices served to bring buyers into the market.

Soda

Bichromate of Soda—Buying is more regular and includes round lots. Some producers are credited with having made special offers direct to large consumers and the stability of quotations has been questioned. It appears that there was an attempt to reduce holdings on the part of certain first hands and this selling pressure brought the general asking price for carlots to 6⅞c. per lb. and 6¾c. per lb. is a possible trading basis according to reports.

Caustic Soda—Interest in forthcoming contract prices is keen but no intimation has been given regarding any changes which may be made and trade opinion seems to agree that very little if any change will be made from the current contract level. Fair inquiry for export was reported last week and sales were said to have been made at 2.80c. per lb. f.a.s. Atlantic ports. This is not a general quotation and the range in prices for export business is one of the features to the market, as up to 3.05c. per lb. is heard. Exports in July reached a total of 8,715,062 lb. which compares with 11,288,786 lb. shipped abroad in July, last year.

Nitrite of Soda—The most important development in this market was found in a report that the Treasury Department had called for the information collected in the investigation into nitrite when the question of a change of duty was at issue. The present investigation grows out of a charge that this material is being sold in this country at prices lower than are asked for delivery to other countries and the anti-dumping provisions of the tariff law have been brought up as a means of preventing importations on such a basis. Prices are still firm with 8¾@9c. per lb. as the ruling quotation.

Prussiate of Soda—This material took on new life last week and attracted considerable interest from buyers. Sellers were offering freely and sales of spot material were made at 9⅛c. per lb. In most quarters 9¼c. per lb. was asked for spot goods. Shipments were said to be available at 9c. per lb. but 9⅛c. per lb. was the open asking price. Imports of prussiate in July were 346,182 lb. as against 53,797 lb. in the corresponding period last year.

Miscellaneous Chemicals

Acetate of Lime—Further evidence of the larger export outlet for this chemical is given in the official figures which give exports in July as 3,195,825 lb. as compared with 2,946,051 lb. Stocks at producing points remain large and production has been curtailed as a result. Stocks are in firm hands and former quotations of $3 per 100 lb. are maintained.

Acetone—Demand has been fairly good and the recent strength in values has been maintained. Competition between different makes has subsided and 16c. per lb. for carlots is the lowest price heard in the present market.

Arsenic—An inactive market is reported and call for spot goods is especially slow. Imported arsenic is nominally quoted at 7½c. per lb. but probably could be shaded. Domestic arsenic is offered at 7¼c. per lb. for forward deliveries. Imports of arsenic for the first 7 months of the year were as follows:

	1923 Lb.	1924 Lb.
Jan.	1,879,639	1,925,486
Feb.	2,115,339	1,545,024
March	1,392,289	2,181,900
April	1,476,066	2,218,339
May	2,118,338	2,386,871
June	2,365,475	2,070,315
July	1,212,354	1,537,902
	12,559,500	13,865,837

Bismuth—Prices eased off here on lower cables from London. Spot metal offered at $1.85@$1.90 per lb.

Bleaching Powder—Reports in the present market indicate that producers are a unit in quoting $1.90 per 100 lb. for large drums, carlots, at works. A short time ago sales were reported at $1.75 per 100 lb. and apparently a break in prices threatened but the reverse has been the case as low priced offerings have been withdrawn and it is doubtful if any bleach can be bought under the open market quotations. Consumers of bleach have been more interested and the movement from works has gained in volume. Export trade has not gained much and official figures place exports in July at 1,664,109 lb. as compared with 2,569,848 lb.

Sal Ammoniac—Good buying interest developed in imported material for prompt shipment from the other side. Prices early in the week were easier and business was placed for fairly large quantities as low as 5⅝c. per lb., New York. But before the close the market steadied and 5⅞c. appeared inside on forward material, with some operators asking 6c. Spot goods held at 6¼c. per lb. On the domestic the market underwent no change.

Formaldehyde — Some sellers reported business at 9c. per lb., works. The undertone of the market was slightly firmer and it was extremely doubtful whether 9c. could be shaded, even on round lots.

Zinc Oxide—Improvement in buying has been slight. Most consumers are covered by contracts placed some time ago. First hands quote 7¾c. per lb. on the American process, lead free, carload lots. French process, red seal, unchanged at 9⅝c. per lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	160.95
Last week	166.45
Sept., 1923	172.00
Sept., 1922	148.00
Sept., 1921	147.00
Sept., 1920	267.00
Sept., 1919	272.00
Sept., 1918	278.00

The sharp decline in crude cottonseed oil offset advances in glycerine, denatured alcohol, caustic potash and ammonium suphate. The weighted index number declined 550 points.

Alcohol

Effective today (Sept. 1) the market for all grades of denatured alcohol is 1c. per gal. higher. Business has improved, and, with basic materials firm, the outlook continues to favor producers. On the revised selling schedule special denatured, formula No. 1, is held at 47c. per gal., in drums, carload lots. Completely denatured, formula No. 5, is offered at 4.6c. per gal., in drums.

There was no change in the methanol situation. With production curtailed first hands were disposed to take a firmer view of the market. The 97 per cent grade held at 76c. per gal., and the 95 per cent grade at 74c. per gal., in bbl., carload lots. Pure held at 75c. per gal., in tank cars, works.

Coal-Tar Products

Moderate Improvement in Call for Phenol Steadies Prices—Benzene Holds Firm—Creosote Easy in Foreign Markets

THE feature in the market for coal-tar products was the slightly firmer tone in U.S.P. phenol. There was some improvement in the demand and first hands were inclined to advance prices. In fact, one seller did raise his views 1c. per lb. Because of the steady position of basic materials, producers of synthetic phenol are unable to force sales at prevailing prices. The decline in gasoline did not affect the market for benzene. The stocks are scanty and leading producers have little to offer except for future delivery. Naphthalene and cresylic acid remain unsettled. Advices from abroad reported continued weakness in creosote oil, notwithstanding curtailment in production. Aniline oil was steady, with demand increasing. Sulphate of ammonia is scarce and prices are nominal.

Alpha-naphthylamine—Producers held quotations at 35@36c. per lb., but demand was restricted to small lots for prompt and nearby delivery.

Aniline Oil and Salt—Demand for aniline oil was better and, with no accumulations in supplies, the market presented a rather firm undertone. First hands quote 16c. per lb., drums extra, carload lots, f.o.b. point of production. Salt was barely steady at 20@22c. per lb.

Benzene—With little change at producing centers, production being restricted because of the slow movement in iron and steel, the market ruled firm in all directions. The fact that gasoline was lowered in price did not help matters, but caused no uneasiness in the attitude of sellers of the coal-tar product. Export trade was slow, due chiefly to the paucity in supplies. Exports of benzene in July, according to latest official information, amounted to 7,749,755 lb., which compares with 27,146,252 lb. in July a year ago. Prices were repeated at 23c. per gal. on the 90 per cent grade, and 25c. per gal. on the pure, tank cars, f.o.b. works.

Creosote—Imports of creosote oil during July amounted to 4,568,587 gal., which compares with 4,894,108 gal. in July a year ago. Foreign markets were quiet and easy. Manchester reports offerings at prices ranging from 5½@6d. per gal., loose, works. During the past week a cargo arrived at New York from the Continent.

Cresylic Acid—Offerings were plentiful and the market was barely steady. Demand routine only. On the 97 per cent material prices ranged from 63@68c. per gal.

Naphthalene—Aside from a little more buying interest on the part of intermediate makers the market was a featureless affair. Stocks of flake naphthalene are comparatively large and prices remain unsettled at 4⅞@5¼c. per lb. Chips, white, held at 4¼@4½c. per lb., carload basis. Crude to import was nominal at 2@2¼c. per lb., according to quality and seller. Imports in July amounted to 1,127,047 lb., which compares with 3,167,958 lb. in July a year ago.

Phenol—One seller advanced the price of U.S.P. phenol to 25c. per lb., drums, carload basis. Others continued to quote 24c. on round lots, prompt and nearby delivery. There was some improvement in demand and, with supplies not burdensome, the tone of the market was steadier in all quarters.

Pyridine—Higher cables steadied the market, and at the close spot material was more or less nominal at $4.25@$4.50 per gal.

Solvent Naphtha—Demand was moderate and some traders reported the market as unsettled. Water white was quotably unchanged at 25c. per gal., tanks, works.

Vegetable Oils and Fats

Good Cotton Crop Prospects Results in Larger Offerings of Crude—Linseed Oil Futures Unsettled—Coconut Oil and Tallow Lower

TRADING in cottonseed oil broadened out on favorable crop developments, and price fluctuations in the past week covered a wide range. Weakness in flaxseed unsettled the market for linseed oil and closing prices were easy, especially in the forward positions. Coconut oil was offered more freely and lower prices were named by Pacific coast sellers. Corn oil was lower in sympathy with cottonseed oil. China wood oil was quotably unchanged. Sales of tallow took place at lower prices. Fishing for menhaden was unsatisfactory and offerings of oil were limited and the market firm.

Cottonseed Oil — Following closely upon publication of the official report on the condition of the cotton crop, placing the probable yield at 12,956,000 bales, the market weakened, with the nearby positions establishing even greater losses than the forward options. Longs liquidated quite a little September and October refined oil. As a result of this selling the technical position of the option market improved considerably and subsequent strength in corn and lard steadied prices for refined oil to such an extent that net changes for the week were not so important. On the break crude oil for September shipment from mills sold at prices ranging from 9@9¼c. per lb., tank car basis. Just before the close, however, 9¾c. was bid for early September crude, and 9.60c. was bid for late September delivery. Spot crude settled nominally at 10¼@10½c. per lb., f.o.b. mills. Cash trade in refined oil was less active, while demand for lard compound was slow. Compound sold down to 14½c. per lb. in the fore part of the week, but later 15½c. was considered the general asking price. It was reported that export demand for pure lard picked up, England taking on quite a fair amount of nearby stuff. Pure lard in the Chicago market, cash, settled at 13.85c. per lb., which compares with 13.65c. per lb. a week ago.

Linseed Oil—Crop reports from the Northwest were favorable and this eased prices for flaxseed. New crop seed will not move in a large way for another month, but a few cars have come on the market in the past week and the quality was uniformly good. In fact a report from a reliable source stated that the oil content of the new seed was well above the average. With the Department of Agriculture estimating the crop at 28,400,000 bu., and some private estimates above 30,000,000 bu., buyers of oil were not inclined to contract ahead. Inquiries for oil were in the market for futures, but in each instance prospective buyers felt that by holding off they might do better later on. Crushers offered early September delivery oil at $1.02 per gal., with second half of September at $1 per gal., carload lots, cooperage included. October oil was offered freely at 96c. per gal., with November-April at 91c. per gal. On November forward one crusher intimated that 90c. could be shaded, cooperage included. Few crushers were in a position to take on immediate business and this explains the wide difference in prices of spot and October oil. Reports from the Argentine were conflicting. Crop conditions in the South American flaxseed belt could be better; prices weakened on the favorable news from North America. On Thursday Buenos Aires quoted September seed at $1.97, which compares with $2.01¾ a week ago. At Duluth cash seed settled at $2.41½, with September at $2.31½ and October at $2.25½ per bu.

China Wood Oil—Demand was moderate, but holders were not pressing material for sale. Spot oil held at 14½c., with nearby at 14¼c., in bbl. On the Pacific coast prompt shipment oil in sellers' tank cars settled at 12¾@13c. per lb., with futures at 12⅝c. per lb.

Falling Off in Imports of Oilseeds in Fiscal Year

Arrivals of oilseeds from foreign ports in the 12 months ended June 30 were smaller than a year ago. Because of increased domestic production importations of flaxseed fell off to the extent of 5,479,186 bu. Fiscal year imports, with a comparison, follow:

	1923–24	1922–23
Cottonseed, lb......	89,416,096	*56,981,974
Castor beans, lb....	80,871,216	88,198,789
Copra, lb..........	299,773,531	306,100,394
Flaxseed, bu.......	19,576,750	25,055,936

Imports of flaxseed for the 12 months, by countries, were as follows:

	1923–24	1922–23
Canada, bu........	3,365,498	2,191,103
Argentina, bu......	16,169,352	22,330,931
Other countries, bu.	41,900	483,902
Total, bu........	19,576,750	25,005,936

* Beginning Sept. 22, 1922.

Corn Oil—Crude oil was offered at prices ranging from 11@11½c. per lb., tank cars, immediate shipment from mills in the Middle West. On late September it was intimated that 10½c. might be done, tank car basis.

Coconut Oil—No important business reported. Prices were lower, December forward shipment from the Pacific coast closing at 8¾c. per lb., sellers' tank cars. Immediate shipment from the coast nominal at 9½c. per lb. Ceylon type oil, prompt shipment from New York, was offered at 9⅝@9¾c. per lb., tank car basis, the price varying according to seller.

Olive Oil Foots — Several lots of prime green foots were available at 9⅝c. per lb., but most holders continued to quote 9¾c., all positions.

Palm Oils—Trading dull. Weakness in tallow lowered buyers' views. Lagos oil for shipment from Africa offered at 8⅝c. per lb., with Niger at 7.90@8c. per lb., c.i.f. basis.

Rapeseed Oil—Refined oil afloat sold at 86c. per gal. Spot oil barely steady at 88c. per gal., asked.

Sesame Oil—Refined oil for nearby arrival from abroad sold at 13¾c. per lb., in bbl. On October forward shipment from abroad the market was nominal at 12⅜@12½c. per lb.

Soya Bean Oil—There were offerings of crude oil for September shipment from the Pacific coast at 10¼c. per lb., sellers' tanks, duty paid. Demand quiet.

Fish Oils—Fishing for menhaden continues poor and offerings of crude oil were scanty. One tank car sold at 50c. per gal., f.o.b. factory. Newfoundland tanked cod oil, spot, nominal at 64@65c. per gal.

Tallow, Etc.—Soap makers bought extra special tallow at 8⅝c. per lb., a decline of ¼c. for the week. At the close buyers were inquiring for additional supplies at 8½c., f.o.b, melters' plant. Yellow grease unsettled at 7⅝c. per lb. Oleo stearine offered at 16½c., a decline of ½c.

Miscellaneous Materials

Antimony—Spot offerings moderate and with inquiry fair prices developed further strength. Reports from China were unfavorable, floods restricting operations. Chinese antimony on spot 10½c. per lb., an advance of ½c. Cookson's "C" brand, 12½@12¾c. per lb. Chinese needle, lump, nominal at 8½@9c. per lb. White oxide, Chinese, 99 per cent, 11@11½c. per lb.

Glycerine—Strong market for crude supported prices for the different grades of refined. Offerings of foreign crude were more numerous and it was reported that some buying took place. Refined glycerine, chemically pure, advanced to 19@19½c. per lb., drums included. Dynamite was firm at 18¼@18½c. per lb., carload basis. Crude soap lye glycerine, basis 80 per cent, offered at 12¼c. per lb., loose, carload lots, f.o.b. point of production in the Middle West, while locally 12½c. represented the market.

Naval Stores — Buying movement slow and prices shade lower. Spirits of turpentine available for immediate delivery at 90c. per gal., in bbl. There was a steady call for rosin for delivery against contract, but new business was not active. On the lower grades the market held at $5.75@$5.85 per bbl.

Shellac—Cables were higher and, on improved buying here, the market advanced from 2@4c. per lb. T.N. for immediate delivery settled at 61@62c. per lb. Bleached, bonedry, was raised to 70@71c. per lb.

White Lead, Etc.—The position of the metal was not so firm as a week ago, offerings coming on the market on the 8c. per lb. basis. Corroders expect no important changes in basic materials and regard the market for pigments as firm at the recent advance. Business for this season of the year has been good. White lead, dry, basic carbonate, held at 10c. per lb., in casks or bbl. Basic sulphate was unchanged at 9½c. per lb. Quotations on red lead, litharge and orange mineral also were repeated.

Imports at the Port of New York

August 22 to August 28

ACIDS—Oxalic—23 csk., Rotterdam, E. Suter & Co.; 27 csk., Rotterdam, R. W. Greeff & Co.; 20 bbl., Hamburg, E. M. Sergeant Co. **Tartaric**—25 csk., Palermo, Order.

ALCOHOL—200 bbl. denatured, Arecibo, Order; 200 bbl. do., Arecibo, C. Esteva.

ALBUMEN—56 cs., Shanghai, F. A. Cundill & Co.; 48 cs., Tientsin, Stein, Hall & Co.; 34 cs., Tientsin, Determann & Co.; 16 csk., Liverpool, W. A. Ross & Co.; 84 cs., Shanghai, D. L. Moss & Co.; 26 cs., Hankow, A. Klipstein & Co.; 112 cs., Hankow, Stein, Hall & Co.; 25 cs., Shanghai, Innis, Speiden & Co.; 415 cs., Taku Bar, Order.

AMMONIUM SULPHATE—20 kgs., Liverpool, Order.

ANTIMONY SULPHIDE—200 csk., Bordeaux, Heemsoth, Basse & Co.

ARCHIL LIQUOR—20 csk., Liverpool, H. Kohnstamm & Co.

BARIUM CHLORIDE—84 csk., Rotterdam, Goldschmidt Corp.

BARYTES—12 csk. ground, Rotterdam, Kodak Park Works.

BLEACHING POWDER—75 cs., Liverpool, H. Kohnstamm & Co.

CALCIUM CHLORIDE—155 dr., Rotterdam, E. Suter & Co.

CAMPHOR—200 cs., Shanghai, Suzuki & Co.; 100 cs., Kobe, Stalman & Co.; 100 cs., Kobe, Hethermann & Co.; 405 cs. crude Keelung, Order.

CHALK—200 bg. and 200 bbl., Antwerp, National City Bank; 500,000 kilos (in bulk), Dunkirk, K. B. Fox; 800,000 kilos, Dunkirk, J. W. Hegman; 602,000 kilos, Dunkirk, Taintor Trading Co.; 1,002 bg. ground, Havre, S. L. Libby Corp.

CHEMICALS—15 cs., Rotterdam, Order; 140 demijohns acid, Rotterdam, R. W. Greeff & Co.; 8 cs., Hamburg, National American Bank; 20 cs., Hamburg, E. Dietzgen Co.; 5 cs., Hamburg, Order; 8 csk., Rotterdam, F. Rudolff; 61 pkg. Rotterdam, Order; 3 bbl., Hamburg, Fezandie & Sperrle; 10 cs., Havre, F. B. Vandegrifht & Co.; 193 pkg., Hamburg, Jungmann & Co.; 2 cs., London, Order; 213 bg., Glasgow, Brown Bros. & Co.; 279 bg., Glasgow, Coal & Iron National Bank.

COLORS—10 csk. ultramarine blue, Genoa, L. H. Butcher Co.; 12 dr. and 2 cs., Hamburg, M. J. Corbett & Co.; 2 csk. dry, Hamburg, Franklin Import & Export Co.; 22 csk. aniline, Rotterdam, Grasselli Dyestuff Corp.; 8 csk. do., Rotterdam, Carbic Color & Chemical Co.; 12 csk. do., Rotterdam, Kuttroff, Pickhardt & Co.; 6 csk. do., Rotterdam, Garfield Aniline Works; 6 csk. aniline, Hamburg, Kuttroff, Pickhardt & Co.; 8 pkg. aniline, Hamburg, Franklin Import & Export Co.; 2 csk. do., Havre, Carbic Color & Chemical Co.; 7 csk. do., Havre, Ciba Co.; 5 pkg. aniline, Havre, American Exchange National Bank; 15 cs. do., Havre, Order; 8 pkg. aniline, Hamburg, Order.

CREAM TARTAR—45 csk., Rotterdam, Order.

CREOSOTE—7,107 tons (in bulk), Antwerp, Order.

COAL-TAR DISTILLATE—3 dr., Liverpool, Order.

CUTCH—500 bg., Singapore, Order.

DIVI-DIVI—238 bg. powdered, Maracaibo, P. J. Rincon & Co.; 2,727 bg., Curacao, Selma Mercantile Corp.; 842 bg., Maracaibo, Suzarte & Whitney.

GAMBIER—518 cs., Singapore, Order.

GLYCERINE—40 dr. crude, Dunkirk, Order; 86 dr. crude, Buenos Aires, Order.

GRAPHITE—675 bg., Kobe, Mitsui & Co.

GUMS—80 bg. copal, Manila, H. W. Peabody & Co.; 227 bg. do., Manila, Chartered Bank of India, Australia and China; 880 cs. sticklac, Singapore, Order; 150 bg. arabic, Port Sudan, Brown, Shipley & Co.; 350 bg. do., Port Sudan, Brown Bros. & Co.; 148 bg. arabic, Port Sudan, Lee, Higginson & Co.; 1,300 bg. do., Port Sudan, Order; 506 bg. copal, Antwerp, Chemical National Bank; 408 bg. copal, Antwerp, Order; 50 bg. arabic, Port Sudan, T. M. Ducke & Sons.

HEMATINE CRYSTALS—15 bbl. Cape Haitien, Logwood Mfg. Co.

IRON CHLORIDE—13 bbl., Hamburg, Mallinckrodt Chem. Works.

IRON OXIDE—29 csk., Liverpool, Reichard-Coulston, Inc.; 63 csk., Liverpool, J. A. McNulty.

LOGWOOD—204,000 lb., Miragoane, Order; 1 lot in bulk, Port au Prince, Stamford Dyewood Co.; 495 bbl. extract, Cape Haitian, Logwood Mfg. Co.; 1 bbl. do., Cape Haitian, Order.

MAGNESITE — 110 csk., Rotterdam, Speiden, Whitfield Co., 250 bg. and 108 bbl. calcined, Rotterdam, Brown Bros. & Co.

MAGNESIUM CHLORIDE—1,026 dr., Hamburg, Innis, Speiden & Co.

MANGANESE ORE—928 bg., Antilla, A. P. Rice.

MANGANESE METAL—20 dr., Liverpool, Order.

MYROBALANS—588 pkts., Calcutta, Order; 7,898 pkts., Calcutta, Order.

OCHER—536 bbl., Marseilles, Reichard-Coulston, Inc, 32 csk., Marseilles, Order.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ANILINE COLORS, dyewood extracts, and tannic acid. Manchester, England. Agency.—11,386.

FERTILIZERS. Florence, Italy. Purchase.—11,355.

GRAPHITE. Dresden, Germany. Purchase and agency.—11,371.

LOGWOOD CRYSTALS, hematin. Hamburg, Germany. Purchase and agency.—11,385.

ROSIN, all grades. London, England. Purchase.—11,383.

SODA CAUSTIC. Bahia, Brazil. Agency.—11,331.

SULPHUR, crude, and copper sulphate. Almeria, Spain. Purchase.—11,387.

TARTAR EMETIC, antimony salts. prussiate of potash, prussiate of soda, bichromate of potash, and bichromate of soda. Manchester, England. Agency.—11,386.

PARAFFINE WAX, 200 to 300 tons monthly. Antwerp, Belgium. Purchases.—11,320.

OILS—Cod—25 csk., St. Johns, Order; 35 csk., St. Johns, R. Badcock & Co. **Coconut**—880 tons (in bulk), Manila, Order; 824 tons (in bulk), Manila, Order. **China Wood**—200 bbl., Hankow, The Sale Co.; 150 bbl., Hankow, Mitsubishi Shoji Kaisha; 85 bbl., Hankow, Mitsui & Co. **Linseed**—148 bbl., Rotterdam, Smith, Weimann Oil Co. **Olive foots** (sulphur oil)—150 bbl., Messina, National City Bank; 100 bbl., Messina, Order; 200 bbl., Palermo, Order. **Palm Kernel**—20 dr., Liverpool, Order. **Palm**—158 bbl., Asahan, National City Bank; 78 csk., Hamburg, African & Eastern Trading Co.; 25 csk., Liverpool, Order. **Poppyseed**—4 dr., Rotterdam, Fezandie & Sperrle. **Perilla**—500 bbl., Dairen, Cook & Swan Co. **Sesame**—3 bbl., Rotterdam, Southern Cotton Oil Co. **Sunflower seed**—68 dr., Rotterdam, National City Bank.

OIL SEEDS—Castor—1,493 bg. Calcutta, Order. **Copra**—2,571 tons. Singapore (at San Francisco), Order. **Linseed**—68,295 bg. and 2,525 tons (in bulk), Buenos Aires, Order.

PLUMBAGO—289 bbl., Colombo, H. P. Winter & Co.; 946 bbl., Colombo, Order; 150 pkg., Colombo, Paterson, Boardman & Knapp.

POTASSIUM SALTS—250 csk., caustic, Rotterdam, Order; lot of muriate (in bulk), Antwerp, Societe Comm. des Potasses d'Alsace.

PUMICE—320 bg., Canneto Lipari, C. B. Chrystal & Co.; 4,186 pkg., Canneto Lipari, T. Van Amringe & Son; 1,952 bg., Canneto Lipari, R. J. Waddell & Co.; 22 csk., Canneto Lipari, Order.

QUEBRACHO—9,820 bg., Buenos Aires, Tannin Corp.

QUICKSILVER—4 pkg., Vera Cruz, Ore & Chemical Corp.

ROSIN—145 csk., Bordeaux, Eastman Kodak Co.

SHELLAC—300 bg., Calcutta, Mechanics & Metal National Bank; 472 bg., Calcutta, Lee, Higginson & Co.; 928 bg., Calcutta, Brown Bros. & Co.; 500 bg., Calcutta, First National Bank of Boston; 100 bg., Calcutta, American Exchange National Bank; 300 bg., Calcutta, Brunswick, Balke Collender Co.; 550 bg., Calcutta, Marx & Rawolle; 509 bg., Calcutta, Bank of the Manhattan Co.; 2,140 bg., Calcutta, Order; 12 cs., Rotterdam, C. F. Gerlach; 121 bg., Hamburg, Kasebier-Chatfield Shellac Co.; 100 cs. garnet, Hamburg, Order; 200 bg. Calcutta, Irving Bank-Col. Trust Co.

SIENNA—75 bbl., Leghorn, E. E. Marks Co.; 30 csk., Leghorn, J. E. Smith & Co.; 16 csk., Leghorn, Order.

SODIUM SALTS—1,488 bg. nitrate, Antofagasta, Wessel, Duval & Co.; 13,761 bg. do., Iquique, Antony Gibbs & Co.; 6,820 bg. do., Iquique, E. I. du Pont de Nemours & Co.; 14,688 bg. do., Iquique, Wessel, Duval & Co.; 30,570 bg. do., Antofagasta, Antony Gibbs & Co.; 23 csk. prussiate, Rotterdam, Meteor Products Co.; 200 csk., hyposulphite, Hamburg, Order; 45 cs. peroxide, Havre, Cooper & Cooper; 144,532 bg. nitrate (6,825 tons of this shipment discharged at Savannah), Iquique, Wessel, Duval & Co.; 1,488 bg. nitrate, Christiana, Order; 4 bbl. hyposulphite, Hamburg, F. Rudolff; 41 kegs prussiate, Liverpool, C. Tennant Sons & Co.; 23,920 bg. nitrate, Iquique, W. R. Grace & Co.; 4 csk. silicate, Glasgow, Pike Mfg. Co.

SILVER SULPHIDES—2 cs., Salaverry, G. Amsinck & Co.

TARTAR—21 csk., Lipari, Tartar Chemical Works; 65 bg., Valparaiso, W. R. Grace & Co.; 81 bg., Marseilles, Order; 190 bg., Marseilles, C. Pfizer & Co.; 532 bg., Marseilles, Royal Baking Powder Co.

VANAD'UM—1,200 bg, Callao, Vanadium Corp. of Am.

WAXES—100 bg. mineral, Hamburg, L. S. Painter; 39 pkg. beeswax, Havana, D. Steengrafe; 9 bg. beeswax, Talcahuano, Banco Aleman Trans.; 100 cs. spermaceti Glasgow, Smith & Nichols; 7 cs. beeswax, Constantinople, African & Eastern Trading Co.

ZINC CHLORIDE—17 bbl., Rotterdam, Order.

ZINC OXIDE—50 bbl., Antwerp, Reichard-Coulston, Inc., 50 bbl., Marseilles, American Exchange National Bank; 50 bbl., Marseilles, Reichard-Coulston, Inc.

Charges of Dumping Made Against Nitrite of Soda Importers

The Treasury Department has asked the Tariff Commission for a full report of its investigations into nitrite, the duty on which recently was increased under the flexible tariff as the result of the commission's report to the President. The information is desired to assist agents of the department in probing charges that there has been dumping of this chemical into the United States. The complaint of alleged dumping was made by the American Nitrogen Products Co., of Seattle, Wash., which was the concern that filed the successful application for an increase in the tariff.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

General Chemicals

Acetone, drums, wks.	lb.	$0.16 - $0.16½
Acetic anhydride, 85%, dr.	lb.	.34 - .36
Acid, acetic, 28%, bbl.	100 lb.	3.12 - 3.37
Acetic, 56%, bbl.	100 lb.	5.85 - 6.10
Acetic, 80%, bbl.	100 lb.	8.19 - 8.44
Glacial, 99½%, bbl.	100 lb.	11.01 - 11.51
Boric, bbl.	lb.	.09 - .09¾
Citric, kegs	lb.	.46 - .47
Formic, 85%	lb.	.12½ - .13
Gallic, tech.	lb.	.45 - .50
Hydrofluoric, 52%, carboys	lb.	.11 - .12
Lactic, 44%, tech., light, bbl.	lb.	.12½ - .13
22% tech., light, bbl.	lb.	.06 - .06½
Muriatic, 18° tanks	100 lb.	.80 - .85
Muriatic, 20°, tanks	100 lb.	.95 - 1.00
Nitric, 36°, carboys	lb.	.04 - .04½
Nitric, 42°, carboys	lb.	.04½ - .05½
Oleum, 20%, tanks	ton	16.00 - 17.00
Oxalic, crystals, bbl.	lb.	.09½ - .09¾
Phosphoric, 50% carboys	lb.	.07 - .08
Pyrogallic, resublimed	lb.	1.55 - 1.60
Sulphuric, 60°, tanks	ton	8.00 - 9.00
Sulphuric, 60°, drums	ton	12.00 - 13.00
Sulphuric, 66°, tanks	ton	13.00 - 14.00
Sulphuric, 66° drums	ton	17.00 - 18.00
Tannic, U.S.P., bbl.	lb.	.65 - .70
Tannic, tech., bbl.	lb.	.45 - .50
Tartaric, imp., powd., bbl.	lb.	.27 - .28
Tartaric, domestic, bbl.	lb.	.29 - .30
Tungstic, per lb.	lb.	1.20 - 1.25
Alcohol, butyl, drums, f.o.b. works	lb	.27 - .30
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.83 - ....
Ethyl 190 p'f. U.S.P., bbl.	gal.	4.81 - ....
Alcohol, methyl (see Methanol)		
Alcohol, denatured, 190 proof		
No. 1, special bbl.	gal.	.53 - ...
No. 1, 190 proof, special, dr.	gal.	.47 - ...
No. 1, 188 proof, bbl.	gal.	.56 - ...
No. 1, 188 proof, dr.	gal.	.50 - ...
No. 5, 188 proof, bbl.	gal.	.52 - ...
No. 5, 188 proof, dr.	gal.	.46 - ...
Alum, ammonia, lump, bbl.	lb.	.03½ - .04
Potash, lump, bbl.	lb.	.02¾ - .03¾
Chrome, lump, potash, bbl.	lb.	.05½ - .06
Aluminum sulphate, com., bags	100 lb.	1.35 - 1.40
Iron free bags	lb.	2.35 - 2.45
Aqua ammonia, 26°, drums	lb.	.06½ - .06¾
Ammonia, anhydrous, cyl.	lb.	.28 - .30
Ammonium carbonate, powd. tech., casks	lb.	.12½ - .12¾
Ammonium nitrate, tech., casks	lb.	.09 - .10
Amyl acetate tech., drums	gal.	2.50 - 2.60
Antimony oxide, white, bbl.	lb.	.09½ - .10¾
Arsenic, white, powd., bbl.	lb.	.07½ - .07¾
Arsenic, red, powd., kegs	lb.	.14½ - .15½
Barium carbonate, bbl.	ton	59.00 - 60.00
Barium chloride, bbl.	ton	72.00 - 74.00
Barium dioxide, 88%, drums	lb.	.17½ - .18
Barium nitrate, casks	lb.	.08 - .08½
Blanc fixe, dry, bbl.	lb.	.03½ - .04
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 - ....
Spot N. Y. drums	100 lb.	2.20 - 2.25
Borax, bbl.	lb.	.05 - .05½
Bromine, cases	lb.	.34 - .38
Calcium acetate, bags	100 lb.	3.00 - 3.05
Calcium arsenate, dr.	lb.	.09 - .09½
Calcium carbide, drums	lb.	.05 - .05½
Calcium chloride, fused, dr. wks.	ton	21.00 - ....
Gran. drums works	ton	27.00 - ....
Calcium phosphate, mono, bbl.	lb.	.06½ - .07½
Camphor, Jap cases	lb.	.68 - .69
Carbon bisulphide, drums	lb.	.06 - .06½
Carbon tetrachloride, drums	lb.	.06½ - .07
Chalk, precip.—domestic, light, bbl.	lb.	.04½ - .04½
Domestic, heavy, bbl.	lb.	.03½ - .04
Imported, light, bbl.	lb.	.04½ - .05
Chlorine, liquid, tanks, wks.	lb.	.04½ - ....
Contract, tanks, wks.	lb.	.04½ - ....
Cylinders, 100 lb., wks.	lb.	.05½ - .07½
Chloroform, tech., drums	lb.	.30 - .32
Cobalt, oxide, bbl.	lb.	2.10 - 2.25
Copperas, bulk, f.o.b. wks	ton	15.00 - 16.00
Copper carbonate, bbl.	lb.	.17 - .17½
Copper cyanide, drums	lb.	.45 - .46
Copper oxide, kegs	lb.	.16½ - .17
Copper sulphate, dom., bbl.	100 lb.	4.60 - 4.75
Imp. bbl	100 lb.	4.37½ - 4.50
Cream of tartar bbl.	lb.	.21 - .21½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 - 2.00
Epsom salt, imp., tech., bags	100 lb.	1.30 - 1.35
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.10 - 2.35
Ether, U.S.P., dr concent'd.	lb.	.13 - .14
Ethyl acetate, 85%, drums	gal.	.92 - .95

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

Ethyl acetate, 99%, dr.	gal.	$1.08 - $1.10
Formaldehyde, 40%, bbl.	lb.	.09 - .09½
Fullers earth—f.o.b. mines	ton	7.50 - 18.00
Furfural, works, bbl.	lb.	.25 - ....
Fusel oil, ref., drums	gal.	3.00 - 3.50
Fusel oil, crude, drums	gal.	2.00 - 2.25
Glaubers salt, wks., bags	100 lb.	1.20 - 1.40
Glaubers salt, imp., bags	100 lb.	.90 - .92
Glycerine, c.p., drums extra	lb.	.19 - .19½
Glycerine, dynamite, drums	lb.	.18½ - ....
Glycerine, crude 80%, loose	lb.	.12½ - ....
Hexamethylene, drums	lb.	.65 - .70
Lead:		
White, basic carbonate, dry, casks	lb.	.10 - ....
White, basic sulphate, casks	lb.	.09½ - ....
White, in oil, kegs	lb.	.11½ - .11¾
Red, dry, casks	lb.	.11 - ....
Red, in oil, kegs	lb.	.13½ - .13¾
Lead acetate, white crys., bbl.	lb.	.14½ - ..
Brown, broken, casks	lb.	.13½ - ..
Lead arsenate, powd., bbl.	lb.	.16 - .18
Lime-Hydrated, bg, wks.	ton	10.50 - 12.50
Bbl., wks.	ton	18.00 - 19.00
Lime, Lump, bbl.	280 lb.	3.63 - 3.65
Litharge, comm., casks	lb.	.10½ -
Lithopone, bags	lb.	.06½ - .06¾
Magnesium carb., tech., bags	lb.	.08½ - .08½
Methanol, 95%, bbl.	gal.	.74 - .76
Methanol, 97%, bbl.	gal.	.76 - .78
Methanol, pure, tanks	gal.	.75 - ....
drums	gal.	.78 - .80
bbl.	gal.	.83 - .85
Methyl-acetone, t'ks.	gal.	.70 - ....
Nickel salt, double, bbl.	lb.	.09 - .10½
Nickel salts, single, bbl.	lb.	.10 - .11
Orange mineral, csk.	lb.	.14 - .14¼
Phosgene	....	.60 - .75
Phosphorus, red, cases	lb.	.70 - .75
Phosphorus, yellow, cases	lb.	.37½ - .40
Potassium bichromate, casks	lb.	.08¾ - .09
Potassium bromide, gran., bbl.	lb.	.25 - .38
Potassium carbonate, 80-85%, calcined, casks	lb.	.05½ - .05¾
Potassium chlorate, powd.	lb.	.06½ - .08¼
Potassium cyanide, drums	lb.	.47 - .52
Potassium, first sorts, cask	lb.	.08¼ - .08½
Potassium hydroxide (caustic potash) drums	lb.	.06¾ - .06¾
Potassium iodide, cases	lb.	3.65 - 3.75
Potassium nitrate, bbl.	lb.	.06 - .07¾
Potassium permanganate drums	lb.	.13½ - .14
Potassium prussiate, red, casks	lb.	.36 - .38
Potassium prussiate, yellow, casks	lb.	.17½ - .18
Salammoniac, white, gran., casks, imported	lb.	.06½ - .06¾
Salammoniac, white, gran., bbl., domestic	lb.	.07½ - .08
Gray, gran., casks	lb.	.08 - .09
Salsoda, bbl.	100 lb.	1.20 - 1.40
Salt cake (bulk) works	ton	16.00 - 18.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 - ....
bags, contract	100 lb.	1.38 - ....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 - ....
bags, contract	100 lb.	1.45 - ....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 - ....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 - 3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	2.80 - 3.05
Sodium acetate, works, bbl.	lb.	.04½ - .05
Sodium bicarbonate, bulk	100 lb.	1.75 - ....
330-lb. bbl.	100 lb.	2.00 - ....
Sodium bichromate, casks	lb.	.06¾ - .07
Sodium bisulphate (niter cake)	ton	6.00 - 7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ - .04½
Sodium chlorate, kegs	lb.	.06½ - .07
Sodium chloride	long ton	12.00 - 13.00
Sodium cyanide, cases	lb.	.19 - .22

Sodium fluoride, bbl.	lb.	$0.08½ - $0.09
Sodium hyposulphite, bbl.	lb.	.02½ - .02¾
Sodium nitrite, casks	lb.	.08¾ - .09
Sodium peroxide, powd., cases	lb.	.23 - .27
Sodium phosphate, dibasic, bbl.	lb.	.03½ - .03¾
Sodium prussiate, yel. bbl.	lb.	.09½ - .10
Sodium salicylic, drums	lb.	.38 - .40
Sodium silicate (40°, drums)	100 lb.	.75 - 1.15
Sodium silicate (60°, drums)	100 lb.	1.75 - 2.00
Sodium sulphide, fused, 60-62% drums	lb.	.02¾ - .03¼
Sodium sulphite, crys., bbl.	lb.	.02 - .02¼
Strontium nitrate, powd., bbl.	lb.	.09¾ - .10
Sulphur chloride, yel drums	lb.	.04½ - .05
Sulphur, crude	ton	18.00 - 20.00
At mine, bulk	ton	16.00 - 18.00
Sulphur, flour, bag	100 lb.	2.25 - 2.35
Sulphur, roll, bag	100 lb.	2.00 - 2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 - .08
Tin bichloride, bbl.	lb.	.14 - ....
Tin oxide, bbl.	lb.	.55 - ....
Tin crystals, bbl.	lb.	.35½ ....
Zinc carbonate, bags	lb.	.12 .14
Zinc chloride, gran, bbl.	lb.	.06 - .07½
Zinc cyanide, drums	lb.	.36½ - .37
Zinc dust, bbl	lb.	.08¾ - .08¾
Zinc oxide, lead free, bag	lb.	.07¾ -
5% lead sulphate bags	lb.	.06¾
10 to 35% lead sulphate, bags	lb.	.06¾ ....
French, red seal, bags	lb.	.09¾ -
French, green seal, bags	lb.	.10¾ -
French, white seal bbl	lb.	.11¾ -
Zinc sulphate, bbl.	100 lb.	3.00 - 3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 - $0.65
Alpha-naphthol, ref., bbl.	lb.	.65 - .75
Alpha-naphthylamine, bbl.	lb.	.35 - .36
Aniline oil, drums	lb.	.16 - .16½
Aniline salt, bbl.	lb.	.20 - .22
Anthracene, 80%, drums	lb.	.70 - .75
Anthraquinone, 25%, paste, drums	lb.	.75 - .80
Benzaldehyde U.S.P., carboys	lb.	1.50 ....
f.f.c. drums	lb.	1.60 - ....
tech, drums	lb.	.68 .72
Benzene, pure, water-white, tanks, works	gal.	.25 - ...
Benzene, 90%, tanks, works	gal.	.23 -
Benzidine base, bbl.	lb.	.80 - .82
Benzidine sulphate, bbl.	lb.	.70 - .72
Benzoic acid, U.S.P., kegs	lb	.75 - .85
Benzoate of soda, U.S.P., bbl.	lb.	.65 - .70
Benzyl chloride, 95-97%, ref. carboys	lb.	.35 - ....
Benzyl chloride, tech., drums	lb.	.25 -
Beta-naphthol, tech., bbl.	lb.	.24 - .25
Beta-naphthylamine, tech	lb.	.65 - .70
Cresol, U.S.P., drums	lb.	.23 - .26
Ortho-cresol, drums	lb.	.28 - .32
Cresylic acid, 97%, works drums	gal.	.63 - .65
95-97%, drums, works	gal.	.58 - .60
Dichlorbenzene, drums	lb.	.07 - .08
Diethylaniline, drums	lb.	.52 - .56
Dimethylaniline, drums	lb.	.35 - .36
Dinitrobenzene, bbl.	lb.	.15 - .17
Dinitrochlorbenzene, bbl.	lb.	.21 - .22
Dinitronaphthalen, bbl.	lb.	.30 - .32
Dinitrophenol, bbl.	lb.	.35 - .40
Dinitrotoluen, bbl.	lb.	.18 - .20
Dip oil, 25%, drums	gal.	.26 - .28
Diphenylamine, bbl.	lb.	.48 - .50
H-acid, bbl.	lb.	.72 - .75
Meta-phenylenediamine, bbl.	lb	.95 - 1.00
Michlers ketone, bbl.	lb	3.00 - 3.25
Monochlorbenzene, drums	lb.	.08 - .10
Monoethylaniline, drums	lb.	1.20 - 1.30
Naphthalene, flake, bbl.	lb.	.04¾ - .05¾
Naphthalene, balls, bbl.	lb.	.05¼ - .05
Naphthionate of soda, bbl.	lb.	.60 - .65
Naphthionic acid, crude, bbl.	lb.	.60 - .62
Nitrobenzene, drums	lb.	.09 - .09
Nitro-naphthalene, bbl.	lb.	.25 - .27
Nitro-toluene, drums	lb.	.13½ - .14
N-W acid, bbl.	lb.	1.00 - 1.05
Ortho-amidophenol, kegs	lb.	2.40 - 2.50
Ortho-dichlorbenzene, drums	lb.	.12 - .13
Ortho-nitrophenol, bbl.	lb.	.95 - 1.00
Ortho-nitrotoluene, drums	lb	.11 - .12
Ortho-toluidine, bbl.	lb.	.14 - .15
Para-aminophenol, base, kegs	lb.	1.20 - 1.25
Para-aminophenol, HCl, kegs	lb.	1.30 - 1.40
Para-dichlorbenzene, bbl.	lb.	.17 - .20
Paranitraniline, bbl.	lb.	.68 - .70
Para-nitrotoluene, bbl.	lb.	.50 - .55
Para-phenylenediamine, bbl.	lb.	1.35 - 1.45
Para-toluidine, bbl	lb.	.75 - .80
Phthalic anhydride, bbl.	lb.	.25 - .30
Phenol, U.S.P., dr.	lb.	.24 - .26
Picric acid, bbl.	lb.	.20 - .22
Pitch, tanks, works	ton	27.00 - 30.00
Pyridine, imp., drums	gal.	4.25 - 4.50
Resorcinol, tech., kegs	lb.	1.30 - 1.40

Resorcinol, pure, kegs	lb.	$2.00 - $2.25
R-salt, bbl	lb.	.50 - .55
Salicylic acid, tech., bbl	lb.	.32 - .33
Salicylic acid, U.S.P., bbl	lb.	.35 - ...
Solvent naphtha, water-white, tanks	gal.	.25 - ....
Crude, tanks	gal.	.22 - ....
Sulphanilic acid, crude, bbl	lb.	.16 - .18
Tolidine, bbl	lb.	1.00 - 1.05
Toluidine, mixed, kegs	lb.	.30 - .35
Toluene, tank cars, works	gal.	.26 - ....
Toluene, drums, works	gal.	.30 - ....
Xylidine, drums	lb.	.40 - .42
Xylene, 5 deg.-tanks	gal.	.38 - .40
Xylene, com., tanks	gal.	.26 - .28

Naval Stores

Rosin B-D, bbl	280 lb.	$5.80 - $5.85
Rosin E-I, bbl	280 lb.	5.95 - 6.05
Rosin K-N, bbl	280 lb.	6.10 - 6.20
Rosin W.G.-W.W., bbl	280 lb.	7.20 - 7.70
Wood rosin, bbl	280 lb.	5.40 - 5.50
Turpentine, spirits of, bbl	gal.	.90 - ....
Wood, steam dist., bbl	gal.	.75 - ....
Wood, dest. dist., bbl	gal.	.56 - ....
Pine tar pitch, bbl	200 lb.	5.50 - ....
Tar, kiln burned, bbl	500 lb.	10.50 - ....
Retort tar, bbl	500 lb.	10.50 - ....
Rosin oil, first run, bbl	gal.	.40 - ....
Rosin oil, second run, bbl	gal.	.42 - ....
Rosin oil, third run, bbl	gal.	.46 - ....
Pine oil, steam dist.	gal.	.60 - ....
Pine tar oil, com'l	gal.	.30 - ....

Animal Oils and Fats

Degras, bbl	lb.	$0.03½ - $0.05½
Grease, yellow, loose	lb.	.07½ - .07¾
Lard oil, Extra No. 1, bbl	gal.	.84 - .85
Lard compound, bbl	lb.	.15½ - .16
Neatsfoot oil, 20 deg., bbl	gal.	1.30 - ....
No. 1, bbl	gal.	.84 - .86
Oleo Stearine		.16½ - ....
Oleo oil, No. 1, bbl	lb.	.16½ - ....
Red oil, distilled, d.p. bbl	lb.	.09½ - .09¾
Saponified bbl	lb.	.09½ - .09¾
Tallow, extra, loose works	lb.	.08½ - ....
Tallow oil, acidless, bbl	gal.	.84 - .86

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.16½ - ......
Castor oil, No. 1, bbl	lb.	.17 - ......
Chinawood oil, bbl	lb.	.14½ - .15
Coconut oil, Ceylon, bbl	lb.	.10½ - ......
Ceylon tanks, N.Y.	lb.	.09½ - .09¾
Coconut oil, Cochin, bbl	lb.	.10½ - ......
Corn oil, crude, bbl	lb.	.13½ - .13¾
Crude, tanks, (f.o.b. mill)	lb.	.11 - .11½
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	10.12½ - 10.25
Summer yellow, bbl	lb.	.14 - .14¼
Winter yellow, bbl	lb.	.15 - .15¼
Linseed oil, raw, car lots, bbl.	gal.	1.02 - ......
Raw, tank cars (dom.)	gal.	.96 - ......
Boiled, cars, bbl. (dom.)	gal.	1.04 - ......
Olive oil, denatured, bbl	gal.	1.18 - 1.22
Sulphur, (foots) bbl	lb.	.09½ - .09¾
Palm, Lagos, casks	lb.	.08½ - .08¾
Niger, casks	lb.	.08 - ......
Palm kernel, bbl	lb.	.10 - ......
Peanut oil, crude, tanks (mill)	lb.	.13 - ......
Peanut oil, refined, bbl	lb.	.17 - .17½
Perilla, bbl	lb.	.14 - .14½
Rapeseed oil, refined, bbl	gal.	.87 - .88
Sesame, bbl	lb.	.13½ - .14
Soya bean (Manchurian), bbl.	lb.	.12 - .12½
Tank, f.o.b. Pacific coast	lb.	.10½ - .10¾
Tank, (f.o.b. N.Y.)	lb.	.10¾ - ......

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.63 - $0.65
Menhaden, light pressed, bbl.	gal.	.64 - ......
White bleached, bbl	gal.	.66 - ......
Blown, bbl	gal.	.68 - ......
Crude, tanks (f.o.b. factory)	gal.	.50 - .55
Whale No. 1 crude, tanks, coast	lb.	......
Winter, natural, bbl	gal.	.75 - .76
Winter, bleached, bbl	gal.	.78 - .79

Oil Cake and Meal

Coconut cake, bags	ton	$33.00 - 34.00
Cottonseed meal, f.o.b. mills	ton	43.00 - 44.00
Linseed cake, bags	ton	44.00 - ......
Linseed meal, bags, spot	ton	46.00 - ......

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.50 - $0.55
Albumen, egg, tech, kegs	lb.	.95 - .97
Cochneal, bags	lb.	.33 - .35
Cutch, Borneo, bales	lb.	.04½ - .04¾
Cutch, Rangoon, bales	lb.	.13½ - .14½
Dextrine, corn, bags	100 lb.	4.32 - 4.75
Dextrine gum, bags	100 lb.	4.82 - 5.09
Divi-divi, bags	ton	40.00 - 42.00
Fustic, sticks	ton	30.00 - 35.00
Fustic, chips, bags	lb.	.04 - .05
Gambier com., bags	lb.	.13½ - .13¾
Logwood, sticks	ton	25.00 - 26.00
Logwood, chips, bags	lb.	.02½ - .03
Sumac, leaves, Sicily, bags	ton	125.00 - 130.00
Sumac, ground, bags	ton	123.00 - ......
Sumac, domestic, bags	ton	50.00 - 55.00
Starch, corn, bags	100 lb.	3.87 - 4.08
Tapioca flour, bags	lb.	.04½ - .06

Extracts

Archil, conc., bbl	lb.	$0.16 - $0.19
Chestnut, 25% tannin, tanks	lb.	.01½ - .02
Divi-divi, 25% tannin, bbl	lb.	.05 - .05½
Fustic, crystals, bbl	lb.	.20 - .22
Fustic, liquid, 42°, bbl	lb.	.08 - .09
Gambier, liq., 25% tannin, bbl.	lb.	.11 - .11½
Hematine crys., bbl	lb.	.14 - .18
Hemlock, 25% tannin, bbl	lb.	.03½ - .04
Hypernic, solid, drums	lb.	.22 - .24
Hypernic, liquid, 51°, bbl	lb.	.12 - .13
Logwood, crys., bbl	lb.	.14 - .15
Logwood, liq., 51°, bbl	lb.	.07½ - .08½
Osage Orange, 51°, liquid, bbl.	lb.	.07 - .08
Osage Orange, powder, bg.	lb.	.14 - .15
Quebracho, solid, 65% tannin, bbl	lb.	.04½ - .04¾
Sumac, dom., 51°, bbl	lb.	.06½ - .06¾

Dry Colors

Blacks-Carbongas, bags, f.o.b. works, contract	lb.	$0.09 - $0.11
spot, cases	lb.	.12 - .16
Lampblack, bbl	lb.	.12 - .40
Mineral, bulk	ton	35.00 - 45.00
Blues-Bronze, bbl	lb.	.36 - .38
Prussian, bbl	lb.	.36 - .38
Ultramarine, bbl	lb.	.07 - .35
Browns, Sienna, Ital., bbl	lb.	.05 - .12
Sienna, Domestic, bbl	lb.	.03 - .03½
Umber, Turkey, bbl	lb.	.04 - .04½
Greens-Chrome, C.P. Light bbl	lb.	.28 - .30
Chrome, commercial, bbl	lb.	.10½ - .11½
Paris, bulk	lb.	.24 - .26
Reds, Carmine No. 40, tins	lb.	4.25 - 4.50
Iron oxide red, casks	lb.	.08 - .12
Para toner, kegs	lb.	.95 - 1.00
Vermilion, English, bbl	lb.	1.30 - 1.35
Yellow, Chrome, C.P. bbls	lb.	.17 - .17½
Ocher, French, casks	lb.	.02 - .03

Waxes

Bayberry, bbl	lb.	$0.21 - $0.21½
Beeswax, crude, Afr. bg.	lb.	.25 - .26
Beeswax, refined, light, bags	lb.	.32 - .34
Beeswax, pure white, cases	lb.	.40 - .41
Candellila, bags	lb.	.23 - .23½
Carnauba, No. 1, bags	lb.	.34 - .36
No. 2, North Country, bags	lb.	.25 - .26
No. 3, North Country, bags	lb.	.23 - .23½
Japan, cases	lb.	.17½ - .18
Montan, crude, bags	lb.	.06 - .06½
Paraffine, crude, match, 105-110 m.p., bbl	lb.	.06½ - .06¾
Crude, scale 124-126 m.p. bags	lb.	.05½ - .06½
Ref., 118-120 m.p., bags	lb.	.06½ - .06½
Ref., 123-125 m.p., bags	lb.	.06¾ - .06¾
Ref, 128-130 m.p., bags	lb.	.06¾ - .06¾
Ref., 133-135 m.p., bags	lb.	.08 - .08½
Ref., 135-137 m.p., bags	lb.	.09½ - .10
Stearic acid, sgle pressed, bags	lb.	.11 - .11½
Double pressed, bags	lb.	.11½ - .12
Triple pressed, bags	lb.	.12½ - .13

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$7.50 - $7.75
Ammonium sulphate, bulk f.o.b. works	100 lb.	2.70 - ....
Blood, dried, bulk	unit	4.10 - 4.15
Bone, raw, 3 and 50, ground	ton	26.00 - 28.00
Fish scrap, dom., dried, wks.	unit	4.50 - ....
Nitrate of soda, bags	100 lb.	2.50 - ....
Tankage, high grade, f.o.b. Chicago	unit	2.50 - ....
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.25 - 3.70
Tennessee, 75%	ton	6.75 - 7.00
Potassium muriate, 80%, bags	ton	34.55 - ....
Potassium sulphate, bags basis 90%	ton	45.85 - ....
Double manure salt	ton	26.35 - ....
Kainit	ton	7.22 - ....

Crude Rubber

Para—Upriver fine	lb.	$0.29½ - ....
Upriver coarse	lb.	.23 - ....
Upriver caucho ball	lb.	.22 - ....
Plantation—First latex crepe	lb.	.27½ - ....
Ribbed smoked sheets	lb.	.26½ - ....
Amber crepe No. 1	lb.	.27 - ....

Gums

Copal, Congo, amber, bags	lb.	$0.08 - $0.10
East Indian, bold, bags	lb.	.13 - .14
Manila, pale, bags	lb.	.18 - .19
Pontinak, No. 1 bags	lb.	.19 - .20
Damar, Batavia, cases	lb.	.23½ - .24
Singapore, No. 1, cases	lb.	.27½ - .28
Singapore, No. 2, cases	lb.	.18½ - .19
Kauri, No. 1, cases	lb	.58 - .64
Ordinary chips, cases	lb.	.21 - .22
Manjak, Barbados, bags	lb.	.06 - .09

Shellac

Shellac, orange fine, bags	lb.	$0.63 - $0.64
Orange superfine, bags	lb.	.65 - .66
A. C. garnet, bags	lb.	.61 - .62
Bleached, bonedry	lb.	.70 - .71
Bleached, fresh	lb.	.60 - .61
T. N., bags	lb.	.60 - .61

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec	sh ton	$300.00 - $400.00
Asbestos, shingle, f.o.b. Quebec	sh. ton	50.00 - 60.00
Asbestos, cement, f.o.b., Quebec	sh ton	15.00 - 20.00
Barytes, grd., white, f.o.b. mills, bbl	net ton	16.00 - 17.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	13.00 - 14.00
Barytes, floated, f.o.b. St. Louis, bbl	net ton	23.00 - 24.00
Barytes, crude f.o.b. mines, bulk	net ton	8.00 - 9.00
Casein, bbl., tech	lb.	.11 - .12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	7.00 - 8.00
Washed, f.o.b. Ga.	net ton	8.50 - 9.00
Powd., f.o.b. Ga.	net ton	14.00 - 20.00
Crude f.o.b. Va.	net ton	6.00 - 8.00
Ground, f.o.b. Va.	net ton	13.00 - 19.00
Imp., lump, bulk	net ton	15.00 - 20.00
Imp., powd.	net ton	45.00 - 50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.50 - 7.25
No. 2 f.o.b. N.C.	long ton	4.50 - 5.00
No. 1 gr'd. N. C.	long ton	15.32 - 21.00
No. 1 Canadian, f.o.b. mill, powd.	long ton	20.00 - ....
Graphite, Ceylon, lump, first quality, bbl	lb.	.05½ - .06
Ceylon, chip, bbl.	lb.	.04½ - .05
High grade amorphous crude	ton	15.00 - 35.00
Gum arabic, amber, sorts, bags	lb.	.11½ - .11¾
Gum tragacanth, sorts, bags	lb.	.50 - .51
No. 1, bags	lb.	1.20 - ....
Kieselguhr, f.o.b. Cal.	ton	40.00 - 42.00
F.o.b. N. Y.	ton	50.00 - 55.00
Magnesite, calcined, f.o.b. Cal.	ton	35.00 - 45.00
Pumice stone, imp., casks	lb.	.03 - .40
Dom., lump, bbl.	lb.	.06 - .08
Dom., ground, bbl.	lb.	.03 - .05
Silica, glass sand, f.o.b. Ind.	ton	2.00 - 2.25
Silica, sand blast, f.o.b. Ind.	ton	2.25 3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 - ....
Silica, glass sand, f.o.b. Ill.	ton	2.00 - 2.50
Soapstone, coarse, f.o.b. Vt., bags	ton	7.50 - 8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 - ....
Talc, 200 mesh, f.o.b. Ga., bags	ton	9.50 - 10.00
Talc, 325 mesh, f.o.b. New York, grade A bags	ton	14.75 - ....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75 - $3.00
Corning	bbl.	1.75 - ......
Cabell	bbl.	1.45 - ......
Somerset	bbl.	1.55 - ......
Illinois	bbl.	1.62 - ......
Indiana	bbl.	1.63 - ......
Kansas and Okla. under 28 deg.	bbl.	.90 - ......
California, 35 deg. and up	bbl.	1.40 - ......

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.18 - ......
Naphtha, V. M. & P. deod, steel bbls	gal.	.17 - .....
Kerosene, ref. tank wagon	gal.	.13 - .....
Bulk, W.W. delivered, N.Y.	gal.	.07½ - .07¾
Lubricating oils:		
Cylinder, Penn., filtered	gal.	.29 - .32
Bloomless, 30@31 grav.	gal.	.20 - .21
Paraffin, pale 885 vis.	gal.	.15½ - .16½
Spindle, 200, pale	gal.	.21 - .21½
Petrolatum, amber, bbls	lb.	.04 - .04½
Paraffine wax (see waxes)		

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140-$145
Chrome brick, f.o.b. Eastern shipping points	ton	50-..
Chrome cement, 40-50% Cr_2O_3	ton	23-27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42-45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35-38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65-68
9-in. arches, wedges and keys	ton	80-85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48-50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48-50
F.o.b. Mt. Union, Pa.	1,000	38-39
Silicon carbide refract. brick, 9-in.	1,000	1,180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 - ......

Ferrochromium, per lb. of Cr, 1-2% C	lb.	\$0.30 - ....
4-6% C	lb.	.12½- ....
Ferromanganese, 78-82% Mn, Atlantic, seabd. duty paid	gr.ton	92.50 - 95.00
Spiegeleisen, 19-21% Mn.	gr.ton	35.00 - 36.00
Ferromolybdenum, 50-60% Mo, per lb. Mo.	lb.	2.00 - 2.25
Ferrosilicon, 10-12%	gr. ton	39.50 - 43.50
50%	gr. ton	72.00 - 75.00
Ferrotungsten, 70-80% per lb. of W	lb.	.87 - .90
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50 - ....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.25 - 3.75

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	\$5.50 - \$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3.	ton	22.00 - ....
C.i.f. Atlantic seaboard	ton	19.00 - 23.00
Coke, fdry., f.o.b. ovens	ton	4.00 - 4.50
Coke, furnace, f.o.b. ovens	ton	3.00 - 3.25
Fluorspar, gravel, f.o.b. mines, Illinois	ton	22.00 - 23.50
Ilmenite, 52% TiO_2 Va.	lb.	.01½- ....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.42 - .46
Manganese ore, chemical (MnO_2)	ton	75.00 - 80.00
Molybdenite 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.70 - ....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 - .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½- .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.12 - ....
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 - ....
Rutile, 94@96% TiO_2	lb.	.12 - .15
Tungsten, scheelite, 60% WO_3 and over	unit	9.00 - ....
Tungsten, wolframite, white, 60% WO_3	unit	8.50 - 8.75
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 - 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 - 12.50
Vanadium pentoxide, 99%	lb.	12.50 - 14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 - 1.25
Zircon, 99%	lb.	.06 - .07

Non-Ferrous Metals

Copper, electrolytic	lb.	\$0.13⅜- \$0.13½
Aluminum, 98 to 99%	lb.	.27 - .28
Antimony, wholesale, Chinese and Japanese	lb.	.10½- ....
Nickel, 99%	lb.	.27 - .30
Monel metal, shot and blocks	lb.	.32
Tin, 5-ton lots, Straits	lb.	.51½
Lead, New York, spot	lb.	.08
Lead, E. St. Louis, spot	lb.	.08
Zinc, spot, New York	lb.	.0655
Zinc, spot, E. St. Louis	lb.	.0620
Silver (commercial)	oz.	.68½
Cadmium	lb.	.60
Bismuth (500 lb. lots)	lb.	1.85-1.90
Cobalt	lb.	2.50-3.00
Magnesium, ingots, 99%	lb.	.90-.95
Platinum, refined	oz.	120.00
Iridium	oz.	260.00-270.00
Palladium, refined	oz.	78.00-83.00
Mercury	75 lb.	72.00- ......
Tungsten powder	lb.	.95-1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	20.37½
Copper bottoms	29.25
Copper rods	20.00
High brass rods	17.25
High brass rods	14.75
Low brass wire	19.50
Low brass rods	20.00
Brazed bronze tubing	24.75
Seamless copper tubing	22.75
Seamless high brass tubing	21.50

OLD METALS—The following are the dealers purchasing prices in cents per pound:

Copper, heavy and crucible	11.50 @ 11.75
Copper, heavy and wire	11.00 @ 11.25
Copper, light and bottoms	9.50 @ ....
Lead, heavy	6.75 @ 6.80
Lead, tea	5.00 @ 5.25
Brass, heavy	6.50 @ ....
Brass, light	5.50 @ ....
No. 1 yellow brass turnings	7.00 @ 7.25
Zinc scrap	3.75 @ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	\$3.34	\$3.34
Soft steel bars	3.24	3.24
Soft steel bar shapes	3.54	3.54
Soft steel bands	3.99	3.99
Plates, ¼ to 1 in. thick	3.34	3.34

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

FLOMATON — The Escambia Sand & Gravel Corp. is said to have tentative plans under advisement for the construction of a new 1-story works for the manufacture of concrete pipe, estimated to cost close to \$25,000, with equipment.

California

STOCKTON—The American Plywood Co., recently organized with a capital of \$500,000 by officials of the California Cedar Products Co., of this city, plans the construction of a new plant for the manufacture of glue in connection with a veneer and plywood works in this vicinity, estimated to cost in excess of \$125,000, with equipment. A list of machinery to be installed will be arranged at an early date. W. D. Thurman, president and general manager of the California Cedar company, will be vice-president of the new organization.

SAN FRANCISCO—The Quality Enameling & Porcelaining Co., 1634-40 Howard St., is arranging for the early purchase of a tract of 4 acres of land for the erection of a new plant for vitreous enameling operations. Plans for the initial unit are being prepared, to be supplemented with other buildings at a later date. To provide for the expansion, the company is disposing of a stock issue of \$450,000. Lyle P. Nutcher is president, and Robert E. Doss, vice-president.

SAN DIEGO—The Moludite Co., San Francisco, F. C. Thornley, president, has plans under consideration for the erection of a new 1-story plant on local site for the utilization of sea weed for the manufacture of a binder for briquetting coal, under a special process. It is estimated to cost about \$30,000, including equipment.

EL NIDO—The Pacific Coast Pipe Mfg. Co., manufacturer of clay pipe products, has awarded a general contract to W. E. Pollard, Redondo Beach, for the construction of a new 1-story plant on local site, for which work will be placed in progress at once. H. E. Owen is president.

Connecticut

BRIDGEPORT — The American Tube & Stamping Co., Stratford Ave., has awarded a general contract to the Riter-Conley Co., Oliver Bldg., Pittsburgh, Pa., for the erection of two 1-story additions to its plant, 72x310 ft. and 72x120 ft., to be equipped for strip steel production.

Delaware

WILMINGTON — The American Oil Co., American Bldg., Baltimore, Md., is completing plans and will soon take bids for the construction of its proposed 1- and 2-story storage and distributing plant on site selected at Wilmington, estimated to cost in excess of \$80,000, with equipment. Louis Blaustein is president; T. J. O'Connell is company architect.

Florida

PAUWAY—The Southern Phosphate Corp., Mulberry, Fla., is said to have plans under way for the construction of a commercial phosphate-producing plant on local site, Pauway, near Haskell, acquired a number of months ago, comprising a large tract of phosphate deposits. The initial works is expected to cost close to \$50,000, with equipment.

MIAMI—The Pleasantville Concrete Products Co., Pleasantville, N. J., A. J. Milliken, president, has acquired the local cement block manufacturing plant of the Coral Gables Co., for a consideration stated at \$95,000. The new owner will take possession in the fall and plans for immediate enlargements, with the installation of additional machinery to double, approximately, the present output. New departments will be established for the manufacture of concrete blocks and other pressed specialties.

DUNEDIN—The Skinner Machinery Co. has preliminary plans under way for the establishment of a new local plant for the manufacture of sulphur dust. A list of equipment to be installed will be arranged at an early date. B. C. Skinner is general manager.

BARTOW—The Oak City Guano Co. has broken ground for the erection of a new local 1-story plant for the manufacture of commercial fertilizer products. A department will be established for the manufacture of insecticides. It is purposed to have the structure ready for the machinery installation at an early date. W. F. Walker is vice-president and general manager.

Illinois

PEORIA—The Mid-West Grain Products Co. has awarded a general contract to Haggerty Brothers, Peoria, for the erection of a new grain alcohol distillery on local site, for industrial alcohol production. Departments will be established for vinegar and kindred products manufacture. It will cost in excess of \$75,000, with equipment. C. W. Traeger is company engineer.

CHICAGO—Clayton Mark & Co., 2031 West 74th St., manufacturer of wrought-iron pipe, etc., has awarded a general contract to the Austin Co., 160 North La Salle St., for the erection of a new 1-story plant addition at 1951 West 74th St., to be equipped as a galvanizing works. It will cost approximately \$50,000. The contractor has also acted as engineer for the work.

Indiana

INDIANAPOLIS — The Roxana Petroleum Co., Arcade Bldg., St. Louis, Mo., will soon take bids for the construction of a new oil storage and distributing plant on site selected at Indianapolis, estimated to cost \$75,000, with equipment.

MUNCIE—The Indiana Steel & Wire Co., South Council St., has awarded a general contract to Albert J. Glaser, 616 South Mulberry St., for the erection of a 1-story addition, 220x320 ft., to be equipped as an annealing works, for which foundations will be laid at an early date.

Maryland

BALTIMORE — The Seaboard Terminal Corp., Union Trust Bldg., has awarded a general contract to John Gill & Sons, Buckley Bldg., Cleveland, O., for the construction of its proposed new oil-refining plant on tract of property recently acquired in the Curtis Bay section, with oil storage and distributing works. It will cost approximately \$750,000, with equipment, and will comprise a number of 1-story units. H. S. Bell, Woolworth Bldg., New York, is engineer. Jerome Sloman is general manager.

BALTIMORE—The Bethlehem Steel Corp. is arranging for immediate expansion at its mills in the Sparrows Point section, to include the installation of additional furnaces and considerable other equipment. A large part of the work will be devoted to extensions in the tinplate mills, and it is purposed to double the output of this department. The estimated cost is placed at \$3,000,000, with machinery, for which contracts are now being placed.

Michigan

HOUGHTON — The Board of Trustees, Michigan College of Mines, is pushing construction on a new metallurgical building at the institution, and purposes to have the building ready for the equipment installation during the fall.

Missouri

ST. LOUIS—H. C. Grote, 111 North Broadway, architect, is completing plans and will soon take bids for the erection of a new plant on local site for the manufacture of chemical products, owner's name temporarily withheld. It will be 1- and 2-story, 150x200 ft., estimated to cost about \$55,000, with equipment.

POPLAR BLUFF—The Ozark Iron Ore & Mfg. Co. has preliminary plans under way for the construction of a charcoal iron furnace and auxiliary mill structures in the Hendrickson district, estimated to cost \$250,000, with equipment.

New Jersey

Jersey City—Fire, Aug. 14, destroyed a portion of the crude drug and compounding plant of S. B. Penick & Co., Inc., 401-11 Jersey Ave., with loss estimated at $100,000, including buildings, equipment and stock. Headquarters are at 113-17 Fulton St., New York.

Bloomfield — The Bakelite Corp., 230 Grove St., manufacturer of composition rubber products, has awarded a general contract to Enstice Brothers, 111 Academy St., Newark, N. J., for the erection of a 2-story addition to its plant to cost about $65,000, to be equipped primarily for laboratory service. Robert Bolton, 31 Clinton St., Newark, is architect.

New York

Long Island City—The Sphinx Lacquer Finishing Co. has leased a building on 2nd Ave., near Freeman St., owned by William and R. J. Welsh, for the establishment of a local plant. It is expected to begin operations at an early date.

North Carolina

Charlotte—The H. A. Garrison Brass Co., Dowd Rd., is said to be planning for the early rebuilding of the portion of its plant detroyed by fire Aug. 16, with equipment replacements. An official estimate of loss has not been announced.

Ohio

Dayton—The Dayton Chemical Co., recently chartered with a capital of $300,000, is perfecting plans for the erection of a new plant on local site now being selected. The initial works is said to be estimated to cost close to $100,000, with machinery. The new company is headed by Frank E. Huston, Dr. H. A. Penfield and Herbert S. Stafford, all of Dayton.

Cleveland — The Cleveland Stone Co., Union Bldg., Cleveland, manufacturer of abrasive products, has plans maturing for the erection of a new plant in the vicinity of Gravel Bank, Warren Township. It is estimated to cost approximately $50,000, with equipment.

Oklahoma

Lawton—The local oil refinery of the Lawton Refining Co. has been acquired by new interests, headed by J. R. Travis and W. P. Fowler, both of Duncan, Okla., which will take immediate possession. Plans are said to be under consideration for extensions and improvements, including the installation of additional equipment.

Oregon

Huntington—The United States Metals Co. has plans under way for the construction of a new concentrating plant at its Bay Horse Mine, about 9 miles from the city, with estimated cost placed at close to $90,000, with equipment. It is expected to begin work at an early date.

Pennsylvania

Connellsville—The Capstan Glass Co., manufacturer of containers and other blown glassware, is planning for enlargements in its plant at South Connellsville, to include the installation of a new furnace and accessory equipment, for which contracts will soon be placed. The expansion is expected to cost in excess of $50,000.

Ambler—Fire, Aug. 16, destroyed a portion of the main wing of the plant of the J. E. Marsden Glass Works, Inc., Brookside Ave., with loss reported at $100,000, including equipment. The loss affected the foundry, cutting department, machine shop and packing department. The company plans for early rebuilding, and will carry out the work in connection with extensions and betterments, recently announced.

Tennessee

Ducktown—The Ducktown Sulphur, Copper & Iron Co. has tentative plans under advisement for the installation of a sintering plant at its properties, for the reclamation of iron from copper ores. It is expected to begin work in the fall.

Sparta — The Southern Paint Pigment Co., recently formed by Thomas A. Miller, Knoxville, Tenn., and associates, with a capital of $50,000, has leased a tract of more than 500 acres of land in this section, with deposits of ocher, umber and other materials, and has plans under way for the construction of a new plant for the production of paint pigments. A list of equipment to be installed will be arranged at an early date.

South Carolina

Spartanburg — The International Agricultural Corp. has awarded a general contract to C. R. Willard & Son, Andrews-Law Bldg., for extensions and improvements in its fertilizer plant to cost approximately $25,000. Additional equipment will be installed. J. A. Foster is superintendent.

Laurens — The Laurens Glass Works, Inc., has preliminary plans for extensions and improvements in its plant, with the installation of additional equipment.

Texas

Corsicana—The Magnolia Petroleum Co., Dallas, Tex., is reported to be planning for the rebuilding of the portion of its local oil storage and distributing plant destroyed by fire, Aug. 13, with loss estimated at $100,000, including equipment and stock.

Eastland—The Phillips Petroleum Co., Ranger, Tex., has secured permission to construct and operate a carbon black plant on site selected in Eastland County, and will perfect plans at an early date. It is estimated to cost approximately $250,000, with equipment. Residue gas for operation will be used from the gasoline plants of the company.

Virginia

Petersburg—The Headway Soap Works, Inc., 114 Old St., recently organized, has taken over a local building and will remodel and equip for a new plant for the manufacture of soaps, washing powders, etc. It is expected to ask equipment bids in about 30 days. Frank H. Hallion is president.

Norfolk—The Robertson Chemical Co., Board of Trade Bldg., manufacturer of fertilizer products, will begin the erection of an addition to its plant in the Money Point section, to cost about $35,000.

New Companies

Boyer-Kienle Co., Inc., Singac, N. J.; refined oils, etc.; $50,000. Incorporators: Charles F. Kienle, Jr., Paul A. Weber and John R. C. Boyer, Singac. The last noted is representative.

Integrity Paint Co., New Haven, Conn.; paints, varnishes, etc.; $50,000. Incorporators: George F. Eckle, H. Uehlinger and J. Frederick Baker, 42 Church St., New Haven.

Southern Clay Co., Memphis, Tenn.; tile and other burned clay products; $10,000. Incorporators: R. H. Gowling, Mark and Stanley Simon, 1146 Minna St., Memphis.

Flora Chemical Co., New York, N. Y.; chemical specialties; 100 shares of stock, no par value. Incorporators: H. H. Kellogg, J. G. Olson and E. Levinsohn. Representative: Benjamin Arnest, 1 Liberty St., New York.

E. Hubschman & Sons, Inc., Philadelphia, Pa.; leather products; $10,000. E. Hubschman, 4538 North Broad St., Philadelphia, is treasurer and representative.

Weinare Rubber Co., New York, N. Y.; rubber products; $20,000. Incorporators: S. S. Muller, C. Bornheim and I. J. Solomon. Representative: Muller & Muller, 200 Broadway, New York.

Southern Plate Glass Co., Inc., Montgomery, Ala.; plate glass, etc.; $50,000. Incorporators: L. A. Lea, F. R. Haynes and J. E. Britt, 802 Felder Ave., Montgomery.

Coit Chemical Co., 375 Coit St., Irvington, Newark, N. J.; chemicals and chemical byproducts; $120,000. Incorporators: Louis and Harris Halperin, and Joseph DiBendetto.

Hartford Molded Products Co., Hartford, Conn.; composition goods; $100,000. Incorporators: Percival H. Spencer, C. D. Tuska and Harrison B. Freeman, 50 State St., Hartford.

Tilsax Laboratories, Inc., 1507 East 11th St., Tulsa, Okla.; chemical specialties; $10,000. Company plans to operate local plant at an early date. J. A. Tilley is president.

Guarantee Block & Tile Co., South St. Paul, Minn.; concrete and cement tile, blocks, etc. Incorporators: Stephen Shorish and Alexander A. Fischbach, 497 Omaha St., St. Paul.

Sun Soap Products, Inc., Richmond, S. I., N. Y.; soaps, washing fluids, etc.; $50,000. Incorporators: J. H. Sears, O. D. Pfaelzer and J. Scott. Representative: L. W. and A. B. Widdecomb, Stapleton, S. I.

Penn Maid Oil Co., Kane, Pa.; refined oil products; $30,000. William J. Sloan, Bradford, Pa., treasurer and representative.

American Maracaibo Co., care of the Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del., representative; refined petroleum products; $50,000,000.

Progressive Ceramics Co., Wheeling, W. Va.; ceramic products; $30,000. Incorporators: R. B. Myers, Harry J. Kahn and E. S. Horkheimer, Riley Law Bldg., Wheeling. The last noted is representative.

Lake Shore Alcohol Corp., Camden, N. J., care of the New Jersey Corporation Guarantee & Trust Co., 304 Market St., Camden, representative; alcohol and kindred products; 2500 shares of stock, no par value.

Sher & Shulman Paint Co., Richmond, S. I., N. Y.; paints, oils, varnishes, etc.; 230 shares of stock, no par value. Incorporators: J. Sher, B. Shulman and W. H. Wetschler. Representative: Elias Bernstein, 30 Richmond Terrace, Tompkinsville, S. I.

F. Rawal Co., Philadelphia, Pa., care of the Capital Trust Co. of Delaware, Dover, Del., representative; chemicals and chemical byproducts; $50,000.

Charlton Laboratories, 31 Charlton St., Newark, N. J., organized; to refine silver, platinum and gold. Charles Gehrie, 689 Hunterdon St., Newark, heads the company.

Atlas Concrete Tile Co., New Orleans, La.; concrete and cement tile products; $20,000. Incorporators: W. J. Foley and Fabian W. Birie, 702 Title Guarantee Bldg., New Orleans. The laast noted is representative.

Farmers Cotton Oil Co., Texarkana, Tex.; cotton oil products; $100,000. Incorporators: W. T. Murphy, D. C. Harrington and C. L. Cabe, all of Texarkana. Tentative plans are under way for the erection of a local mill.

Pedeze Chemical Corp., New York, N. Y.; chemicals and chemical byproducts; $10,000. Incorporators: J. Levy, G. Adelman and C. B. Levine. Representative: Adelman & Levine, 1650 Broadway, New York.

North American Cement Corp., care of the Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del., representative; $100,000; manufacture cement, operate a cement mill.

Mellenville Paper Co., Mellenville (Columbia County), N. Y.; paper products; $75,000. Incorporators: W. A. Weber and R. W. Moore. Representative: L. Brockow, Albany, N. Y., attorney.

Federal Tallow Co., Boston, Mass.; tallow, greases, oils, etc.; $100,000. Incorporators: Samuel Bergson, Harry Bergson and William C. Maguire, all of Boston.

Utility Process Corp., New York; compounds and composition products; nominal capital $5,000. Incorporators: J. C. Swain, A. R. Kellegrew and F. A. Huck. Representative: Merrill, Rogers, Gifford & Woody, 60 Broadway, New York.

Seneca Oil Corp., 439 West 33rd St., Chicago, Ill.; refined oils; $10,000. Incorporators: Owen E. Hulse, Daniel J. Carlos and W. E. Roberts.

Industrial Notes

Dings Magnetic Separator Co., Milwaukee, Wis., announces that R. L. Johnstone has taken over its St. Louis territory, with offices in St. Louis.

General Furnace Co., 1015 Chestnut St., Philadelphia, Pa., has been organized as successor to the American Industrial Furnace Co., Boston, and the Electric Furnace Construction Co., Philadelphia, with the following officers: T. E. Brown, president; Frank Hodson and H. O. Breaker, vice-president; M. G. Hopkins, secretary and treasurer.

Sanford Riley Stoker Co., Worcester, Mass., has taken over the entire business of the United Machine & Manufacturing Co., Canton, Ohio, manufacturer of the Harrington stoker. This consolidation brings under one management the Riley, Jones, Murphy and Harrington stokers, making it possible to offer a type of stoker suitable for every possible combustion need. Mosher separators as heretofore made by the United Machine & Manufacturing Co. will be manufactured and sold by the A. W. Cash Co., Decatur, Ill., manufacturer of boiler specialties and a subsidiary of the Sanford Riley Stoker Co.